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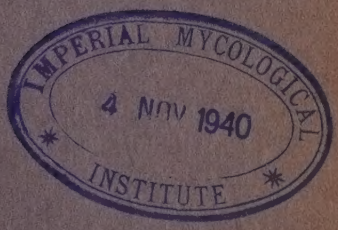

THE VETERINARY BULLETIN

1940

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IMPERIAL BUREAU OF ANIMAL HEALTH
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ENGLAND

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DISEASES CAUSED BY BACTERIA AND FUNGI

SLANETZ, L. W., & NAGHSKI, J. (1940). **Studies on Streptococci of Bovine Mastitis.**—*J. infect. Dis.* **66.** 80–85. 2 tables. [Numerous refs.]

A total of 680 cultures of weakly haemolytic streptococci were isolated from cows showing evidence of mastitis infection and were classified by means of biochemical and serological tests. 573 were identified as *Str. agalactiae*, 83 as *Str. uberis*, 15 as *Str. dysgalactiae* and 9 as *Str. fecalis*. The results clearly indicate that *Str. agalactiae* is the chief causative agent of streptococcal mastitis. It was shown that these organisms are readily transmissible in a herd of cows unless certain definite precautions are taken to prevent their spread, and also that they generally produce a chronic infection once they become established in the udder. The authors consider that *Str. uberis*, *Str. dysgalactiae* and *Str. fecalis* are atypical mastitis streptococci and that they are responsible only for a sporadic type of mastitis infection which is not readily communicable. No cultures of *Str. agalactiae* could be isolated from the mammary tissue of five cows which were known to be free from mastitis infection during a period of 2–3 lactation periods on the basis of laboratory tests made at 3-month intervals. Details are given of the technique employed throughout the experiment. EDWARDS's medium [*V. B.* **10.** 573.] is of great value as a means of differentiating *Str. agalactiae* from other types of mastitis streptococci and as an aid in the diagnosis of streptococcal mastitis.—J. R. LAWSON.

I. TODD, E. W. (1938). **The Differentiation of Two Distinct Serological Varieties of Streptolysin, Streptolysin O and Streptolysin S.**—*J. Path. Bact.* **47.** 423–445. 9 tables, 2 appendixes. [16 refs.]

II. TODD, E. W. (1939). **The Streptolysins of Various Groups and Types of Haemolytic Streptococci; a Serological Investigation.**—*J. Hyg., Camb.* **39.** 1–11. 3 tables. [Numerous refs.]

III. TODD, E. W. (1938). **Lethal Toxins of Haemolytic Streptococci and their Antibodies.**—*Brit. J. exp. Path.* **19.** 367–378. 6 tables. [7 refs.]

IV. ABDALLA, N. W., & MCLEOD, J. W. (1939). **The Antigenic Properties of Streptolysin.**—*Ibid.* **20.** 245–259. 12 tables. [17 refs.]

I. In this paper properties of the oxygen-sensitive streptolysin (Sn.O.) and the serum-extractable streptolysin (Sn.S.) are described.

Sn.O. was prepared by growing streptococci in Hewitt's glucose bicarbonate broth, and the culture was then filtered into a flask containing sodium hydrosulphite. Reduced lysin was pipetted into tubes which were sealed with vaseline. After one month's storage at 2°C. any traces of Sn.S. had completely disappeared. Sn.S. was produced in serum-free broth, the filtrate being stored over CO_2 ice in a thermos flask. In such a filtrate both streptolysins were present. Weld's haemotoxin [*V. B.* **4.** 597.] was prepared in horse-flesh infusion broth, and the deposited streptococci were extracted with inactivated horse serum. The extract was stored over CO_2 ice. It is a powerful haemolysin, but is a mixture of Sn.O. and Sn.S.; no method has been found of preparing Sn.S. free from Sn.O.

Anti-streptolysin S (A.Sn.S.) was prepared by injecting living streptococci into animals, but A.Sn.O. was formed at the same time; the latter could be neutralized with Sn.O. Weld's haemotoxin produced only A.Sn.O. when injected into animals, as A.Sn.S. in the free state is non-antigenic. In clinical human infections with group A streptococci the A.Sn.O. titre is often greatly increased, but high A.Sn.S. titres are seldom acquired. A.Sn.O. and A.Sn.S. are both found in normal horse sera. In horses undergoing immunization for the production of scarlet fever antitoxin, high A.Sn.O. titres but not A.Sn.S. titres are produced.

Very little is known about the pathogenic importance of these streptolysins or their relation to leucocidin, as all attempts to prepare leucocidin were unsuccessful. Appendixes describe the method of titrating A.Sn.S. and A.Sn.O.

II. A.Sn.S. serum was prepared from one group A strain; it neutralized Sn.S. prepared from all the types of group A streptococci, but not that prepared from groups B-K. A.Sn.O. serum was then prepared from the same group A strain. With the probable exception of type II, A.Sn.O. serum neutralized Sn.O. prepared from all types of group A streptococci. Group B streptococci from non-pathogenic human sources failed to produce Sn.O. Three strains from fatal human infections produced a streptolysin resembling Sn.O. but it was not neutralized by A.Sn.O. Group C strains of human origin produced typical Sn.O. but four strains from animal infections produced a haemolysin which appeared to differ both chemically and serologically from Sn.O. [It is probable that the four animal strains were sorbitol + : trehalose — : lactose + strains. There are, however, sorbitol — : trehalose + : lactose + strains of animal origin (see *V. B.* **10.** 231.). It would be interesting to know what streptolysin is produced by these strains and by *Str. equi*]. Group G strains of human and animal origin produced Sn.O. which was neutralized by A.Sn.O., but it is suspected that animal strains also produced another streptolysin. Groups D, E, F, H and K failed to produce Sn.O. in glucose bicarbonate broth. There is evidence that group F strains produce Sn.O. *in vivo* and it is possible that in suitable media all groups of haemolytic streptococci would produce Sn.O.

Pneumococcus haemolysin and tetanolysin are probably both related to Sn.O. Streptolysins prepared by the methods described are probably simpler substances than the labile antigen described by Mudd *et al.* [*V. B.* **10.** 313].

III. High-titred A.Sn.S. serum protected mice against Weld's haemotoxin, but A.Sn.O. serum did not. The proportion of A.Sn.S. in Weld's toxin was, however, much greater than that of A.Sn.O. Haemoglobinuria was a feature of the disease produced by injection of haemotoxin. A.Sn.O. serum protected mice against Sn.O., the protective power of sera being proportional to the A.Sn.O. content. It was previously shown that A.Sn.O. produced a partial but unexplained immunity to living streptococci. A.Sn.S. serum gave no protection, nor did it enhance the protective effect of A.Sn.O. serum. The lethal effect of the streptolysins was proportional to the haemolytic titres. The lethal action of Sn.S. appeared

to be due to intravascular haemolysis, but another factor was probably concerned in the lethal effect of Sn.O.

This work confirmed the fact that there is no antigenic relation between the two streptolysins.

IV. A meat extract broth prepared at temperatures not exceeding 75°C. was used as a basis for preparing Hewitt's glucose bicarbonate broth. Twelve strains of streptococci were studied, most of which were isolated from cases of sore throat; one strain from scarlet fever belonged to group A. [The serological classification of the other strains is not given.] In some cases reduction of culture filtrates increased their haemolytic activity, especially if the haemolytic titre had been greatly lowered by filtration, which was not always the case.

Serum-free haemolysin was found to be antigenic; the antibodies produced gave protection against toxic effects. Serum haemolysin was prepared in meat broth containing 20% horse serum. It did not produce homologous antibodies, or antibodies against serum-free haemolysin, although rabbits developed an immunity against its toxic effects. In contrast to this, haemolysin produced in rabbit serum broth, as well as producing immunity to the toxic effects, also produced considerable antihaemolytic titres.

Todd's conception [see above] of Sn.S. and Sn.O. is discussed, and it is concluded that he has either overlooked some factor, or the horse-serum broth filtrates used in this study contained only A.Sn.S. while the rabbit serum broth haemolysin contained both Sn.O. and Sn.S. It is suggested that streptolysin is a single substance readily forming complexes with other organic molecules, which may modify its resistance to heat and to oxidation and its antigenic properties. [This rather complex subject has already been dealt with in several papers (see *V. B.* **2.** 516; **3.** 579; **4.** 173, and **5.** 229.)]—John Francis.

Barron, N. S. (1940). **Early Septicaemia in Anthrax.**—*Vet. Rec.* **52.** 77.

B. describes the presence of *Bacillus anthracis* in the blood stream at least 30 hours before death, in a bullock in contact with anthrax fatalities. The animal had a temperature, and *B. anthracis* was demonstrated microscopically in relatively large numbers in blood smears. Six hours afterwards, as an experiment, oxygen was administered subcutaneously under pressure; death occurred 24 hours later.
—J. R. Lawson.

Ivánovics, G. (1939). Chemische Untersuchungen über die Polysaccharide des Milzbrandbazillus. [**Chemical Research on the Polysaccharides of the Anthrax Bacillus**].—*Zbl. Bakt. I.* (*Orig.*). **144.** 244*–246*. 1 table.

The author finds that the specific polysaccharide of the body of the anthrax bacillus can be separated in a pure condition by suitable treatment of agar culture. He remarks that many of the older records are vitiated by the fact that the products isolated contained certain water soluble substances ("Kantene") from the agar itself. His polysaccharide which reacted with anthrax serum at a dilution of 1–2 million but not with pure anticapsular serum, contained neither pentoses nor glycuronic acid, *i.e.* in contrast to the substances isolated by Combiescu *et al.* The hydrochloric acid hydrolysis of the polysaccharide gave *d*-glucosamine chlorhydrate. Whilst the conclusion that glucosamine is the sole basic foundation of the polysaccharide molecule is not excluded, it is thought on the other hand that perhaps other substances are concerned in its synthesis.—A. W. Stableforth.

de Mendonça Machado, A. (1938). Tuberculose bovina e suina em Portugal. [**Bovine and Porcine Tuberculosis in Portugal**].—*Repos. Lab. Pat. vet.*,

Lisboa. **3.** 183–195. 1 fig., 2 tables. [Numerous refs.] [English and French summaries].

The author discusses avian type infection of cattle and swine. The results obtained in Lisbon do not support the conclusions reached by the majority of European investigators. Tuberculous material from 102 bovines was identified in every case as bovine in origin, and of 41 tuberculous swine similarly examined, one only was found to have been infected from an avian source.

It is noted that in a large number of supposed tuberculous glands reaching the laboratory the disease was in reality due to *Corynebacterium pyogenes*.—J. PASFIELD.

I. REID, J. (1939). **Infection of a Bovine by Human Type Mycobacterium tuberculosis.**—*J. comp. Path.* **52.** 318–321. 1 table. [6 refs.]

II. NIELSEN, F. W., & PLUM, N. (1940). Menneskets lungetuberculose som smittekilde for kvæget. **[Pulmonary Tuberculosis in Man as a Source of Infection for Cattle].**—*Beretn. 5. nord. Vet.-møde, Kbh., 1939.* pp. 116–136. 1 table. [4 refs.] [English summary]. [Abst. from English version in *Vet. J.* **96.** 6–18. (1940)].

I. A Guernsey heifer which had given contradictory results in the double intradermal tuberculin test done in the neck, the caudal fold single intradermal test, and the vulva intradermal test, was killed and subjected to a careful P.M. examination. No macroscopic lesions of TB. were observed in any organ or lymph node. The l.nn. were grouped and made into suspensions as follows :– (a) prescapsular, popliteal and precrural l.nn. ; (b) parotid, pharyngeal and sub-maxillary l.nn. ; (c) mediastinal and bronchial l.nn., and (d) parotid, iliac, mesenteric and supra-mammary l.nn. Each group was inoculated into four g. pigs, two rabbits and two tuberculin-tested fowls. The animals from groups (a), (c) and (d) did not contract TB. In group (b) three g. pigs and one rabbit inoculated intravenously developed generalized TB. The rabbit inoculated subcutaneously developed only a localized lesion. The fowls did not contract TB.

Cultures from the g. pigs, when typed by cultural and animal pathogenicity methods, proved to be of the human type of tubercle bacilli. It was not possible to trace any contact between the heifer and open cases of TB. in man.

II. The authors draw attention to the fact that infection of cattle with TB. may occur from cases of pulmonary TB. in man. Three types of infection may be caused :– (1) infection with human type tubercle bacilli ; (2) infection with bovine type tubercle bacilli, and (3) infection from human beings excreting tubercle bacilli of a type intermediate between the human and bovine types. In this article only the first two types of infection are described.

Infection of a heifer with human type tubercle bacilli was found in a caseated and calcified nodule in a mesenteric gland. Tubercle bacilli could not be demonstrated microscopically, but were obtained by cultural methods. Human type tubercle bacilli were also obtained from the sputum of one of the former attendants of the animal who was in a sanatorium.

Case records are given of 17 cases of TB. in previously TB.-free cattle, which had been infected from persons with open pulmonary TB. due to the bovine type. These cases were found in the course of tuberculin testing of 632 head of cattle, 384 of which gave positive tuberculin reactions.

Although these cases of infection of cattle from human beings are not common, they are not easy to investigate owing to the difficulties of proper examination of suspected dairy personnel. The authors suggest this might be overcome by some form of legal compulsion. They also stress the need for close co-operation between the veterinarian and physician in these cases.—D. L. HUGHES.

INNES, J. R. M. (1940). **The Pathology and Pathogenesis of Tuberculosis in Domesticated Animals Compared with Man.**—*Vet. J.* **96.** 42–50 and 96–105. 82 figs. on 9 plates, 1 diagram. [Numerous refs.]

The first part of this paper is a brief review of knowledge of the reaction of the tissues to tubercle bacilli and of the pathogenesis of the disease in man. The second part deals with TB. in the dog and cat, with special reference to pathogenesis. The description is based on the literature and on eight cases of the disease in dogs and 13 in cats which the author has investigated.

In both the dog and cat the disease corresponds to TB. of childhood—primary infection being followed by local extension and dissemination to distant sites. In the dog, primary infection occurs more commonly in the respiratory tract (five out of eight cases); on the other hand, primary alimentary TB. is more frequent in the cat (all 13 cases). Details of individual cases are not given. The tissue reaction to the tubercle bacillus is similar in both species, but central liquefaction of the lesions is more common in the cat.—E. G. WHITE.

BOQUET, A., & LENCI, E. (1940). Recherches sur la teneur des produits tuberculeux en bacilles de Koch. [**Amounts of Tubercle Bacilli in Tuberculous Products**].—*Ann. Inst. Pasteur.* **64.** 293–300. 5 tables. [6 refs.]

The authors' technique for the enumeration of tubercle bacilli in tuberculous materials is as follows :– 9 c.c. of 4% saline solution is added to 1 c.c. of sputum or other fluid to be tested. This is thoroughly mixed with a pipette, and left in a 37°C. incubator for 30 min. being shaken at intervals. It is then diluted 1 : 10, 1 : 100 and 1 : 1,000 with distilled water, the pipette being changed for each dilution. Subcultures of 0·1 c.c. of each dilution are then made on to three tubes of Löwenstein's egg or Petragnani's malachite green medium. [This corresponds, according to the authors, to 0·1, 0·01 and 0·001 mg. of the original product.] The inoculum must be evenly spread over the surface of the medium. The media are examined in six weeks and two months after inoculation and the number of colonies counted. When the material is dense in consistency, it is cut up with sterile scissors, ground up with sand and a few drops of 4% saline solution, and then diluted as described.

The results with the cultural method were correlated, in the main, with those following g. pig inoculation.

The authors consider the method of particular value in studying the progress of TB. in all types of the disease in man.—D. L. HUGHES.

GARPMAN, I. (1939). Desinfektionsförsök på tuberkelbaciller med " Tebecit ". [**Disinfection Trials of Tubercle Bacilli with " Tebecit "**].—*Svensk VetTidskr.* **44.** 283–286. 3 tables.

In a small scale experiment using g. pig inoculation and controls, " Tebecit " (sodium ortho-phenyl-phenolate), at a strength of 2%, killed tubercle bacilli in sputum and uterine secretion in one minute and in milk in five minutes.—J. E.

TURLEY, L. A., & DOUGHERTY, T. F. (1940). **The Relation of Lymphocytes to the Activity of Mycobacterium tuberculosis.**—*J. Lab. clin. Med.* **25.** 828–834. 4 graphs. [17 refs.] [Authors' summary copied *verbatim*].

1. Lymphocytes play an important part in the resistance of the body to the action of tubercle bacilli.

2. This role is due to the activity of the active living lymphocyte. It is not due to any extra-cellular agglutinin, enzyme, or lysin which acts on the bacilli, but must be due to the lymphocytes disposing of the bacterial toxins, thus robbing the

bacteria of their initial assault ammunition. This conclusion is further strengthened by the observation of all pathologists that tubercle bacilli seem to grow more readily in lymphatic rather than any other tissue. In this case the lymphocytes, not attacking the bacteria but disposing of their metabolic products inimical to themselves, allow a more profuse growth.

3. There is a definite lymphocytosis, the magnitude of which varies with the progress of the tubercular disease.

4. The neutrophile-lymphocyte index is highest at the onset of the disease and again at the approaching death of the animal.

FERNBACH, E., & RULLIER, G. (1939). Étude de divers groupements fonctionnels de la glycérine vis-à-vis du développement de plusieurs races de bacilles tuberculeux du type humain et bovin. [**The Influence of Glycerin and Allied Chemical Compounds on Human and Bovine Tubercle Bacilli**].—*C. R. Soc. Biol. Paris.* **131.** 1142–1145.

The authors investigated the reasons for the influence of glycerin on the growth of tubercle bacilli. Glycerin functions as a primary and a secondary alcohol, and by substituting primary or secondary alcohols for glycerin attempts were made to see which chemical grouping was responsible for the growth of the bacilli. The basic medium consisted of a mixture of potassium phosphate, ammonium sulphate and magnesium citrate. This medium was used with the test alcohol, and potato impregnated with this mineral mixture and with the test alcohol was also employed. Among the alcohols tested were isopropyl alcohol, propyl alcohol, commercial glycol, trimethylene glycol, inosite and ethylene glycol.

The authors conclude that the two primary and one secondary alcohol groups as linked in glycerin ($CH_2OH—CHOH—CH_2OH$) are necessary for a good growth of tubercle bacilli, whether on potato or on the mineral mixture alone. The slight but normal growth seen on potato with the mineral mixture and various alcohols is due to the starch in the potato. Microscopically, organisms from the abnormal looking growths obtained on potato with certain alcohols appeared normal morphologically and in their staining affinities. No growth was obtained with the mineral mixture with various alcohols other than glycerin.—D. L. HUGHES.

ANDERSON, R. J., CREIGHTON, M. M., & PECK, R. L. (1940). **The Chemistry of the Lipids of Tubercle Bacilli. LX. Concerning the Firmly Bound Lipids of the Avian Tubercle Bacillus.**—*J. biol. Chem.* **133.** 675–693. 6 tables. [13 refs.]

10·8% of firmly bound lipoids, liberated on treatment with dilute HCl were extracted with ether and chloroform from 500 g. thoroughly defatted avian tubercle bacilli. By forcing a chloroform solution of these lipoids through a Chamberland filter, the filtrable fraction was separated from the non-filtrable. Investigation of this latter fraction showed these lipoids to contain on saponification :– (a) 64% ether soluble constituents, which were further split up into hydroxyacids of high M.W., lower fatty acids and neutral material, consisting mainly of δ-eicosanol-2, $CH_3\ (CH_2)_{17}\ CH(OH)\ CH_3$, and (b) 31% water soluble polysaccharide, half of which was hydrolysable to mannose, δ-arabinose and galactose with traces of glucosamine and inosite.

The filtrable fraction gave on saponification 18% polysaccharide and 80·9% ether soluble material which comprised 69% hydroxyacids, 3·7% lower fatty acids and 8·2% neutral material, again mainly δ-eicosanol-2. The hydroxyacid called avian γ-mycolic acid was split on heating to 270°–280°C. under reduced pressure, giving a volatile crystalline acid and an unsaturated residue. This acid corresponded to a

tetracosanoic acid $C_{24}H_{48}O_2$, but differed in crystal form from the ordinary straight chain fatty acids.

[The nomenclature of those substances, insoluble in water but soluble in the fat solvents (ether, chloroform, benzene, etc.), variously designated as " lipides ", " lipids ", " lipoids ", " lipines " and " lipins " is at present in a very confused state. The group is very heterogeneous and various authors frequently apply different terms to the same substances. Many English journals now appear to be referring to these compounds as " lipoids " and in an endeavour to clarify the position, it would be better to use this term throughout as a synonym for the above designations. Accordingly the " lipids " or " lipides " used throughout this paper have been changed in this abstract to " lipoids ", and this explanation is given in order that the reader shall not be confused through the change of terminology.]

—ALFRED EDEN.

NOBREGA, P., & REIS, J. (1938). Vacinação contra cólera aviaria com amostra viva (tipo azul) de " Pasteurella avicida ". [**Vaccination against Fowl Cholera**].—*Arq. Inst. biol., S. Paulo.* **9.** 77–84. 8 tables. [6 refs.] [English summary].

The authors report on tests with a strain of *Past. aviseptica* of low pathogenicity obtained from a typical " fluorescent " strain, by successive cultures in broth containing 0·25 % of lithium chloride. The " blue type " strain obtained had, in addition to the normal cultural and biochemical characteristics of *Past. aviseptica*, the following special characteristics :– colonies small, semi-transparent, bluish, non-fluorescent, non-pathogenic when given intranasally and of low pathogenicity when given intramuscularly.

Used as a live vaccine this strain of *Past. aviseptica* conferred a very high degree of immunity on fowls when administered intramuscularly in two doses. Each dose was 0·3 c.c. of a 24 hours' broth culture and eight days were allowed to pass before giving a second similar dose. A single inoculation conferred immunity on 50–60 % of the birds. The inoculation was always given in the pectoral muscles.

Immunity did not last long, gradually disappearing after three months. Too large doses proved fatal.—MILLER WATSON.

DAVIS, G. E. (1940). *Bacterium tularense* : **Its Persistence in the Tissues of the Argasid Ticks** *Ornithodoros turicata* **and** *O. parkeri*.—*Publ. Hlth Rep., Wash.* **55.** 676–680. 3 tables. [1 ref.] [Author's summary copied *verbatim*].

1. *Bact. tularense* may survive for at least 674 and 701 days, respectively, in the tissues of *Ornithodoros turicata* and *O. parkeri*, but is not transmitted during feeding.

2. The virulence of the organism was not adversely affected by the long period of residence in these ticks nor by the failure of the ticks to receive a blood meal.

I. VERGE, J. (1939). La prophylaxie de l'avortement infectieux des juments provoqué par Salmonella abortus equi. [**Prophylaxis of Infectious Abortion in Mares caused by** *Salmonella abortus equi*].—*Rep. 13th int. vet. Congr. 1938.* **1.** 507–518. [In French : English, German and Italian summaries. Discussion pp. 537–540 in English and German].

II. FUJIMURA, S. (1939). **Some Observations on the Infection with** *Bacillus abortus equi* **in Horses.**—*Ibid.* 532–537. [In English : French, German and Italian summaries. Discussion pp. 537–540 in English and German].

I. V. discusses equine infectious abortion in France. The most common

cause is *S. abortus equi* (41·7 %), although it may be due to streptococci, *Bacterium coli*, *Brucella abortus* (bovine type) or *Bact. equirulis*.

The strains of *S. abortus equi* isolated from the aborted foetuses, maternal discharges, and infected uteri are usually of the smooth type, but they have a tendency to become rough in culture.

Mares with agglutination titres of less than 1 : 300 are not considered to be infected, titres between 1 : 300 and 1 : 500 are suspicious, and titres above 1 : 500 indicate infection.

Vaccines prepared from growth on agar and formolized to 0·4 % are said to give good results. Two doses are given subcutaneously at an interval of a month.

It is stated that occasionally *S. abortus equi* may cause infection in man.

II. F. summarizes the methods of diagnosis and control used for this disease in Japan. He considers that in horse breeding districts in Japan the sera of mares should be examined periodically for agglutinins for *S. abortus equi*. The presence of " O " agglutinins 1 : 1,280, or " H " agglutinins 1 : 1,280 or lower is regarded as critical on the ninth day after abortion or later. In regions where the organism is prevalent, pyaemia including lymphadenitis and arthritis may occur. *S. abortus equi* may be obtained from these lesions. The author states that immune serum is of value in limiting the spread of the disease in newly infected areas. A formolized vaccine materially reduces the numbers of abortions in establishments where the disease is endemic.—D. L. Hughes.

I. Lerche. (1937). Die beim Tier vorkommenden Erkrankungen der Bakterien der Paratyphus-Enteritis-Gruppe und ihre Epidemiologie. [**The Epidemiology of Salmonella Infection in Animals**].—*Zbl. Bakt. I.* (*Orig.*). **140**. 39–52. 7 tables. [Numerous refs.]

II. Mitscherlich, E. (1937). Antagonismus zwischen Bact. coli commune und Bact. enteritidis Gärtner. [**Antagonism Between** *Bacterium coli* **and** *Salmonella enteritidis*].—*Dtsch. tierärztl. Wschr.* **45.** 574–578. 1 table, 1 graph. [Numerous refs.]

III. Steuer, W. (1937). Ueber Paratyphusbazillen vom Typ Suispestifer und Breslau als Eitererreger. [*Salmonella cholerae-suis* **and** *S. typhi-murium* **as Pus-Forming Organisms**].—*Zbl. Bakt. I.* (*Orig.*). **140.** 67*–71*.

I. A description is given of the salmonella organisms which are responsible for serious disease in young animals ; as a rule they cause only latent infection in adults. They have adapted themselves to different animals and often cause epizootics in only one species, although they are capable of causing disease in other species. The different types of *S. enteritidis* have their distinct specificity, but the types of *S. typhi-murium* are not so distinct. The former is commoner than the latter in Germany, according to meat inspection records (in a ratio of about 5 : 1). The following are found comparatively rarely :– the Kiel, Rostock and Jena varieties of *S.e.*, *S. cholerae-suis* and *S. bovis-morbificans*.

The above relative frequency does not apply to cases of food poisoning in man, in which *S. typhi-murium* is by far the commonest organism.

II. M. reports antagonism between a strain of *Bact. coli* and a strain of *S. enteritidis* when grown on agar slopes. After 13 days *S.e.* had nearly died out; the higher the pH the more potent was the antagonistic effect of the *Bact. coli*. After ten days products appeared in the cultures which inhibited the growth of both bacteria. The products were filtrable ; those which affected *Bact. coli* were heat-stable and adsorbable ; those which affected *S.e.* were not heat-stable. An attempt was made to remove *S.e.* from the intestine of a bovine chronic excretor of the organism by feeding the *Bact. coli* cultures. The excretion of *S.e.* was

reduced but not stopped. Paratyphoid infection can be spread by animals such as water fowls, pigeons and mice. Direct transmission from horses and cats to man has also been observed, and human carriers are well known.

III. S. reports three cases in which *S. cholerae-suis* var. *kunzendorf*, one case in which *S. cholerae-suis* and two cases in which *S. typhi-murium* were associated with suppuration. The patients were children and enteritis preceded the pyogenic lesions.—M. F. Benjamin.

Stewart, D. F. (1939). **A Note on a Mortality due to *Salm. typhi-murium* Infection among Ducks.**—*Aust. vet. J.* **15.** 67–68.

S. records the death of 2,000 ducks from 2½–6 weeks of age out of a total of 10,000. The mortality was due to *S. typhi-murium* which was isolated and serologically identified.—T. S. Gregory.

—. (1938). **Eleventh Annual Conference of Laboratory Workers in Pullorum Disease Control, Virginia Polytechnic Institute, Blacksburg, Virginia, May 18, 19, 20, 1938.** pp. 32. Blacksburg, Virginia : Virginia Polytechnic Institute. [4to] [Mimeographed].

This report embraces about a dozen general and special papers on poultry diseases in the United States and is not limited to pullorum disease. In most cases the discussion on the papers is given, but not the papers themselves. The scientific matter discussed has been published elsewhere and has been dealt with by *Index Veterinarius* and the *Veterinary Bulletin.*

A resolution was passed at the meeting deploring the uncontrolled sale of " bacterins " against fowl cholera and fowl typhoid, the value of which has never been substantiated. Two delegates to the conference reported that the use of such biological products could stimulate the production of antibodies which interfere with the detection of disease carriers by serological methods.—W. J. I.

Haupt, H. (1939). Beobachtungen in einem frisch mit Bangschen Verkalben befallenen Bestande. [**Observations on a Herd Newly Infected with Brucellosis**].—*Arch. wiss. prakt. Tierheilk.* **75.** 20–28. 1 table.

H. describes an active outbreak of contagious abortion in a herd of 16 cows. A week after the first abortion an agglutination test was carried out and all were negative except the cow which aborted. Nevertheless, all the remaining cows aborted from 2–8 months later. Details are given of the blood tests and bacteriological findings. Eight animals were negative 18, 53, 53, 74, 155, 178, 188 and 192 days respectively before aborting ; seven reacted, some only shortly before aborting and at a low titre. H. discusses the possible reasons for the now well recognized fact that some infected animals fail to react until after calving or abortion and puts forward the view that some anti-agglutinin may be produced in the tissues of the foetus, adding that this supposition accords with the fact that antibodies cannot be detected in the foetal blood even when the maternal blood is strongly positive.

Twelve foetuses were examined culturally. In 11 cases the lungs gave positive results, in only seven of these were the contents of the foetal stomach positive, four of the latter also being microscopically positive.

H. concludes that eradication methods are not to be recommended in an active outbreak, that even low agglutination titres [details of suspension or method of testing not given] are of positive significance, that lung cultures from the foetus are the best and that a negative result in a pregnant cow does not exclude infection.

—A. W. Stableforth.

SACHWEH, P. (1939). Einige Beobachtungen ueber versteckte Abortusherde. [**Hidden Foci of** *Brucella abortus* **Infection in Herds**].—*Berl. Münch. tierärztl. Wschr.* Feb. 17th. 105–106. [1 ref.]

In abortion control S. recommends the detection and isolation of cows excreting brucella organisms in the milk. He uses a rapid agglutination test of whole milk carried out on the farm. He states that care must be taken to distinguish non-specific flocculation, *e.g.*, in cases of mastitis. S. deprecates the use of live brucella vaccines on cattle because of the danger of setting up carriers.

[In the discussion S. finds it necessary to include remarks of a racial and political nature, a fact which discourages serious consideration of the remainder of his paper.]—H. E. HARBOUR.

HOLTH, H. (1939). En oversikt over fremgangsmåten og resultatene ved bekjempelsen av den smittsomme kastning i Norge. [**Review of Progress of Control of Bovine Brucellosis in Norway**].—*Svensk VetTidskr.* **44.** 431–447. 2 charts.

This is an account of the position of bovine brucellosis control in Norway at the middle of 1939. The national control scheme came into operation at the beginning of 1935 [see *V. B.* **5.** 544 and 794] and at the end of 3½ years the disease had been nearly eradicated. In 1935 there were 3,053 known infected herds: by August, 1939, 2,943 (96%) had been freed from infection. [It is not stated what proportion of the country's herds these figures represent. The disease is compulsorily notifiable when its presence is suspected.]

Two diagrams illustrate the progress made in the 11 provinces of Norway between the end of 1936 and of 1938. [The paper is largely a narrative of H.'s experiences given as a lecture to the Swedish Veterinary Association, and does not contain much in the way of statistical records.]—J. E.

HUDDLESON, I. F. (1938). **Report of Progress of Studies in Brucella Infections Supported by the Rackham Fund 1937-38 [U.S.A.].**—*Rep. Mich. Bd Agric. 1938.* pp. 84–85.

The value was studied of sulphanilamide and brucellin in the treatment of brucellosis. In the case of the former, the results were negative in cattle and g. pigs, and, in the case of the latter, inconclusive in the human beings treated. Work was carried out on " brucellergen ", for intradermal tests, and on the endo-antigen fraction of brucella cells as an immunizing agent.

The brucella culture collection was maintained and studied, and 414 laboratory tests for the diagnosis of undulant fever were made.—J. C. WALLACE.

DUMARESQ, J. A. (1939). **A Case of Black Disease in the Horse.**—*Aust. vet. J.* **15.** 53–57. 3 figs., 1 table. [3 refs.]

D. describes a fatal case of necrotic hepatitis in a horse. P.M. examination revealed lesions in the liver similar to those found in black disease (infectious necrotic enteritis) of sheep and the causal organism of that disease, *Clostridium oedematiens*, was isolated. D. did not detect any agent which had damaged the liver, thus allowing latent spores to develop. The absence of fluke infestation and the presence of strongylid worms suggested to him that it was likely that wandering strongylid larvae had probably acted in that way.—T. S. GREGORY.

DUMARESQ, J. A. (1939). **Braxy in Tasmania.**—*Aust. vet. J.* **15.** 252–255. [3 refs.]

Thirty years ago a diagnosis of braxy was made in certain districts in Tasmania, but this was not confirmed.

D. now describes an outbreak of braxy similar to that occurring in Europe. From 10–20% of the young sheep die from this disease on one property during each winter. A sheep autopsied immediately after death showed typical lesions and *Clostridium septique* was isolated in pure culture from several sites. The organism was identified as *Cl. septique* Type III by use of agglutinating sera. This is the first time that braxy has been diagnosed with certainty in Australia. Appropriate prophylactic vaccination appeared to give good protection.

—W. I. B. Beveridge.

Bass, C. C. (1939). **Observations on the Specific Cause and the Nature of " Quail Disease " or Ulcerative Enteritis in Quail.**—*Proc. Soc. exp. Biol., N.Y.* **42.** 375–380. [1 ref.]

In this disease lentil-shaped ulcers of varying size occur in the lower third of the ileum and caecum; the mortality may reach 75%. A Gram-negative anaerobic bacillus was isolated from the ulcers and once from the yolk-sac of a quail chick. The best growth was obtained in glucose agar (0·25% agar). The disease was reproduced in quail by infection with this bacillus. Observations suggest that this disease may be transmitted through the egg.—R. Fisher.

McEwen, A. D. (1940). **The Recovery of *Vibrio foetus* from Aborted Bovine Foetuses and the Significance of this Organism as a Cause of Abortion in Cattle.**—*Vet. Rec.* **52.** 337–340. 4 tables. [Numerous refs.]

During the past six years 247 foetuses from 45 herds, in which efforts were being made to control contagious abortion, have been examined bacteriologically. *V. foetus* infection was found in five of the foetuses that came from three of the herds. The age of the infected foetuses varied from 5–7 months. The evidence from these three herds shows that *V. foetus* was not responsible for any serious outbreak of abortion. Abortions due to this organism are usually sporadic and of little importance. The source of infection is obscure.—R. Fisher.

Waksman, S. A. (1940). **On the Classification of Actinomycetes.**—*J. Bact.* **39.** 549–558. [20 refs.]

W. criticizes previous classifications of the actinomycetes based on occurrence in nature, pigment formation, aerobiosis, proteolytic action or colonial appearance, and proposes a system which indicates the relationship of the various constituent groups to the true bacteria and includes forms omitted by other authors. Four families are recognized according to mycelial characters and type of reproduction. The family Mycobacteriaceae, with mycelium absent or rudimentary, comprises the motile genus *Mycoplana* and a non-motile group, subdivided into the acid-fast genus *Mycobacterium* and the non-acid-fast genus *Corynebacterium*. A true mycelium is formed by the family Proactinomycetaceae, which reproduces by segmentation into coccoid or bacillary elements, and by the families Actinomycetaceae and Micromonosporaceae both of which form an undivided mycelium, the former reproducing by serial chains of conidia and the latter by terminal and single conidia.—R. O. Muir.

DISEASES CAUSED BY PROTOZOAN PARASITES

Westphal, A. (1938). Die Pathogenese der Amöbenruhr bei Mensch und Tiere. I. Das Wesen der pathogenetischen Wirksamkeit der Ruhramöbe. II. Die Pathogenese der Amöbenruhr beim Menschen. [**Pathogenesis of Amoebic**

Dysentery in Man and Animals. I. The Nature of the Pathogenic Action of Dysentery Amoebae. II. Pathogenesis of Amoebic Dysentery in Man]. —*Arch. Schiffs- u. Tropenhyg.* **42.** 343–349 and 441–459. 2 figs. [Numerous refs.]

The two theories of the pathogenic action of amoebae by production of a toxin or a ferment are discussed, and it is pointed out that most amoebic lesions are contaminated by bacteria, so that the histological picture may be obscured. The purest amoebic lesions occur in recent infections of the submucosa, and in these histolysis occurs with no cellular infiltration, and necrosis follows the spread of the amoebae and does not precede it. As the histolysis does not depend on the destruction of the amoebae it is argued that they must produce an extracellular ferment. In the absence of such ferment the destruction of the tissue could only be explained by necrosis followed by phagocytosis ; but necrosis occurs only after amoebic invasion and no necrotic particles are detectable in the amoebic cytoplasm. That no febrile reaction results from amoebic infection is also considered to contra-indicate toxin production. No toxin could be detected in culture extracts, but a proteolytic ferment was present. The necrosis which occurs is explained by the histolysis of certain tissues interfering with the nutrition of others.

In Part II the theory is put forward that the human intestinal epithelium is normally resistant to the ferments of *Entamoeba histolytica* which occurs normally in the intestinal tract as a small amoeba which encysts. Bacterial damage or functional factors may lower the resistance of the epithelium, and the amoebae may then penetrate the tissues, and as a result of altered nutritional conditions, may hypertrophy and lose their ability to encyst. The greater prevalence of amoebic dysentery in the tropics is explained as due to functional derangement of the intestinal epithelium owing to adverse climatic conditions.—U. F. Richardson.

Schilling, C. (1939). Versuche zur Schutzimpfung gegen Tsetsekrankheiten. VIII. Mitteilung. [**Research on Protective Inoculation against Trypanosomiasis. VIII**].—*Z. ImmunForsch.* **96.** 521–522. [For previous parts, see *V. B.* **7.** 586].

This note records that out of 11 calves, in which immunization was attempted by the inoculation of minimal doses of *Tryp. congolense*, six were still alive after 4–6 years' exposure in a tsetse area. Of 13 untreated controls only one was still alive. Of nine calves vaccinated with killed trypanosomes only two were still alive. Although this result cannot be considered to furnish conclusive evidence of the efficiency of the minimal dose method of immunization, yet it is considered suggestive, and it is pointed out that improvement might be effected by further protective inoculations before exposure. It is also reported that all of six calves born in the fly belt had matured satisfactorily. This is cited as evidence of the importance of a previous immunity of the mother.—U. F. Richardson.

Reichenow, E. (1939). Ueber die Entwicklungsfähigkeit der Kulturformen von *Trypanosoma gambiense* und *T. congolense* in Glossinen. [**The Ability of Cultural Forms of** *Tryp. gambiense* **and** *Tryp. congolense* **to Develop in** *Glossina*].—*Arch. Schiffs- u. Tropenhyg.* **43.** 197–202. [7 refs.]

In view of the resemblance of trypanosomes in culture to the developmental stages occurring in *Glossina*, it was suggested that a higher percentage of tsetse infection might be obtained by organisms from culture than by organisms from the blood. Specimens of *G. morsitans* were fed on cultures of *Tryp. gambiense* and *Tryp. congolense* respectively. In the case of *Tryp. gambiense* gut infections

developed in several flies, but the infections did not extend to the salivary glands, and the flies did not become infective. In flies fed on *Tryp. congolense* cultures, a few developed gut infections, and in two an infection of the hypopharynx was detected, but the flies under experiment did not transmit infection to a g. pig on which they were fed. A strain of *Tryp. gambiense* which had lost its power of developing in tsetse failed to develop in culture.

R. concludes that cultural forms of trypanosomes are capable of undergoing multiplication in tsetse, but that infection is not more easily obtained with cultures than with blood, though cultured forms may complete a developmental cycle in *Glossina*.—U. F. Richardson.

Guibert, J., & Boscq, H. (1938). Présence constante chez les trypanosomés non traités ou non guéris de *Trypanosoma gambiense* dans la moelle osseuse. Résultats de 38 nouvelles ponctions du sternum. [**The Constant Presence of *Tryp. gambiense* in the Bone-Marrow in Untreated or Uncured Cases of Trypanosomiasis**].—*Ann. Méd. Pharm. colon.* **36.** 525–532. 3 figs. on 1 plate, 3 tables. [1 ref.]

In comparing methods of demonstrating trypanosome infection in suspected new cases of sleeping sickness, the examination of the bone-marrow gave little or no advantage over ordinary methods of examination of the blood, lymph node juice or cerebrospinal fluid, but was at least equally reliable. Out of six suspected cases which were negative to the other methods, one was found positive by bone-marrow examination, and out of two suspected relapses negative to other methods trypanosomes were demonstrated in one.

The presence of leishmanial forms in bone-marrow preparations is also recorded.—U. F. Richardson.

Kuhn, L. R. (1938). **The Effect of Splenectomy and Blockade on the Protective Titer of Antiserum against Trypanosoma equiperdum.**—*J. infect. Dis.* **63.** 217–224. 1 fig., 3 tables. [13 refs.]

An antiserum against *Tryp. equiperdum* was obtained from inoculated sheep, and its protective trypanocidal property tested against the homologous trypanosomes in normal, splenectomized, and splenectomized and blockaded mice. No attempt was made to exclude ablastic activity as all evidence indicates that antisera for pathogenic trypanosomes are purely trypanocidal. Specific sheep serum in doses of 0·4–0·6 c.c., intraperitoneally, protected normal mice against infection when 2,500–3,000 trypanosomes were injected subcutaneously. Splenectomy alone did not appear to decrease the protective value of the serum, but splenectomized and blockaded mice required a much larger dose of the serum (about 1·8 c.c.).

When smaller numbers of trypanosomes were injected a smaller quantity of serum gave protection, and the effect of splenectomy and blockade was much reduced. When sensitized trypanosomes were injected into normal mice and into splenectomized and blockaded mice, the former became infected as frequently and as soon after injection as the latter. It is argued that if splenectomy and blockade do not affect the resistance of the mice to sensitized trypanosomes they cannot inhibit phagocytosis, decrease complement or reduce opsonins, but it is suggested they may act by interfering with the passively acquired antibody in macrophage tissue. Blockade has been shown to retard the removal of bromsulphalein from the peripheral blood, and it may reduce the functional efficiency of macrophages.
—U. F. Richardson.

I. Culbertson, J. T., & Wotton, R. M. (1939). **Studies on Age Resistance against Trypanosome Infections. VI. Production of Ablastin in Rats of Different Age Groups after Infection with** *Trypanosoma lewisi*.—*Amer. J. Hyg.* Sect. C. **30.** 101–113. 2 tables, 2 graphs. [14 refs.]

II. Kolodny, M. H. (1940). **Studies on Age Resistance against Trypanosome Infections. VII. The Influence of Age upon the Immunological Response of Rats to Infection with** *Trypanosoma cruzi*.—*Ibid.* **31.** 1–8. 1 fig., 1 table. [11 refs.] [For previous parts see *V. B.* **9.** 693, and **10.** 166].

I. An attempt was made to ascertain whether age had an influence on the ability of rats to produce ablastin, the antibody which inhibits the multiplication of *Tryp. lewisi*. Rats in groups aged 8, 17, 25 and 60 days were used for the experiments and the ablastic response to infection was judged by the percentage of dividing trypanosomes present in the blood at various intervals after infection, or by the variation in length of the blood trypanosomes, it being considered that greater variation indicated a higher rate of multiplication.

The percentage of dividing trypanosomes reached its peak in eight days in the 25-day-old group, and in four days in the 60-day-old group, after which it declined, the majority of animals recovering. In the 8-day-old group the percentage of dividing trypanosomes increased till death. Similar results were given by the method of judging ablastin production by the coefficient of variation of the trypanosomes. It is, therefore, concluded that the greater capacity of the older rat to form ablastin antibody is a major factor in its greater resistance to infection with *Tryp. lewisi*.

II. The amount of antibody present in a unit volume of serum produced by rats infected with *Tryp. cruzi* was judged by pooling the sera from age groups of infected rats, and inoculating 0·5 c.c. intraperitoneally into test rats one hour before they were artificially infected. Each test animal received further doses of the serum under test on the third and fifth days following infection. The extent of protection conferred was judged by the number of trypanosomes present in the blood at various periods after infection, and by the length of life of the test animal.

The results indicated that young rats up to 20 days of age fail to respond to *Tryp. cruzi* infection by the production of antibody in sufficient quantity to be detectable by the test method. Recently weaned rats, about 30 days old, produce antibodies which become demonstrable after eight days, and reach a maximum after 35 days. Adult rats behave similarly, but the titre of their sera in antibody is much greater than that of immature animals.—U. F. Richardson.

Packchanian, A. (1940). **Natural Infection of** *Triatoma heidemanni*, **with** *Trypanosoma cruzi* **in Texas.**—*Publ. Hlth Rep., Wash.* **55.** 1300–1306. 2 figs. on 2 plates, 1 table. [11 refs.] [Author's summary copied *verbatim*].

1. The reduviid bug, *Triatoma heidemanni*, popularly known as "blood sucker", "mexican bed bug", and "kissing bug", collected in or around dwellings in Temple, Tex., was found to be naturally infected with *Trypanosoma cruzi*. This blood-sucking insect has already become a household pest in certain localities and represents a potential vector for spreading Chagas' disease.

2. The strain of *Trypanosoma cruzi* collected in Temple produced infection in monkeys (*Macacus rhesus*), mice (*Mus musculus*), American deer mice (*Peromyscus eremicus eremicus*, *P. leucopus noveboracensis*, *P. polionotus polionotus*), rats (*Rattus norvegicus*), and guinea pigs.

3. Cultural tests proved to be very fruitful. Out of 49 cultural attempts from experimentally infected animals, 42 gave positive cultures *in vitro*. The sub-

cultures of the Temple strain of *Trypanosoma cruzi* have been maintained *in vitro* for over a year and are still infective to susceptible test animals.

4. Sixty-four animals, which were inoculated with the intestinal contents of *Triatoma heidemanni* or trypanosomes derived therefrom, were sacrificed at various intervals. Histopathological studies in these animals revealed 11 cases of intracellular leishmania forms of *Trypanosoma cruzi*. These forms were found in cardiac muscle fibers (7 times), in skeletal muscles (5 times), and in scattered fat cells (once).

ATAÏ, A. (1938). Contribution à l'étude comparée des leishmanioses humaines et animales. Leur répartition géographique. **[Comparative Study of Human and Animal Leishmaniases. Their Geographical Distribution]**.—*Thesis, Alfort.* pp. 235. 2 tables, 2 maps. [Numerous refs.]

This thesis gives a good review of literature dealing with human and canine leishmaniasis but contains little original material. It includes a description of the leishmanial parasites, their morphology, biological characters and pathogenicity, and describes the diseases which they cause in human beings and dogs, and the methods of confirming diagnosis based on the clinical symptoms. Two species of the parasite are recognised, *L. donovani*, causing generalized leishmaniasis in human beings and dogs, and *L. tropica*, causing cutaneous leishmaniasis in both species of host. The geographical distribution in Europe, Asia, North Africa and South America is described, and it is pointed out that the visceral and cutaneous forms, though they may exist in the same area of country, do not occur together; one form may exist in one part of a town and the other form in another part. It is suggested that *L. tropica* infection may give immunity to *L. donovani*.

Distribution of the canine disease is said to coincide with human infection except that the canine infection has not been recorded in India. [A few cases have recently been recorded.] It is suggested that the absence of canine infection in India may be due to an immunity of Indian dogs, or that dogs may escape infection because they are not kept in close contact with man.

The clinical manifestations of infection vary according to the host reaction of the infected species, and canine infection differs from that of man in that clinical symptoms may not develop. In dogs keratitis and furfuraceous eczema commonly occur, whilst in man these conditions have not been recorded as manifestations of the infection.—U. F. RICHARDSON.

I. GIRAUD, P., & GAUBERT. (1938). Valeur pratique des divers procédés de recherche des leishmanies pour le diagnostic du kala-azar méditerranéen. **[Practical Value of Various Methods of Detecting Leishmania for the Diagnosis of Mediterranean Kala-Azar]**.—*Pr. méd.* **46.** 4–6. [2 refs.]

II. BENHAMON, E. (1938). La recherche des leishmanies dans le diagnostic du kala-azar. **[The Search for Leishmanial Bodies in the Diagnosis of Kala-Azar]**.—*Ibid.* 121–122. 6 figs., 1 table. [Numerous refs.]

I. Discussing the diagnosis of human leishmaniasis, the authors state that serological tests are not absolutely reliable, and that the presence of the parasites should always be demonstrated. The examination of the blood, liver and skin, and attempts to culture from blood or spleen all gave unsatisfactory results. Spleen puncture gave the best results, but is said to cause a mortality of 1 % from internal haemorrhage. Examination of bone marrow, obtained in adults from the sternum and in children by trephining the tibia near the epiphysis gave very reliable results, and it is said to be simple, not painful, and free from danger. In children the

puncture of lymph nodes gave results almost as reliable as those obtained by spleen puncture, but in adults lymph node specimens could not always be obtained.

II. B. recommends sternal puncture with a trocar needle as the method of choice for routine examination for leishmanial infection. It only requires simple aseptic precautions, is reliable, free from danger to the patient and does not necessitate rest in bed. He points out that monocytosis of the lymph node juice is almost diagnostic of leishmaniasis, apart from the presence of leishmanial bodies. He agrees with GIRAUD and GAUBERT (see I) as to the value of other methods of detecting infection, except that he considers that skin scrapings are often an aid to diagnosis. He points out that, in fact, all the methods have their uses in diagnosis and in estimating the severity of infection.—U. F. RICHARDSON.

PAPANTONAKIS, E. (1939). Bekämpfungsmassnahmen der Kala-Azar in Canea (Kreta). [**The Control of Leishmaniasis in Crete**].—*Arch. Schiffs- u. Tropenhyg.* **43.** 273–275. 1 fig.

It is thought that in Crete dogs act as the reservoir of kala-azar, and in 1933 the majority of the dogs in the island were destroyed. All dogs in the island are now inspected in April of each year, and any which show clinical symptoms of infection or give a positive formol-gel reaction are destroyed. If a case of kala-azar occurs in a village all the dogs in the area are destroyed. Of 1,115 dogs inspected in 1938, 229 gave a positive formol-gel test, but only 5% of these showed the characteristic clinical symptoms of leishmaniasis.—U. F. RICHARDSON.

FENG, L. C., & CHUNG, H. L. (1939). **The Development of Leishmania in Chinese Sandflies fed on Dogs with Canine Leishmaniasis.**—*Chin. med. J* **56.** 35–46. 5 figs. on 2 plates, 5 tables. [12 refs.] [In English].

In view of the evidence brought by ADLER and THEODOR that dogs serve as a reservoir for human kala-azar in the Mediterranean basin, experiments were carried out on the common sandflies of Peiping, *Phlebotomus sergenti* var. *mongolensis* and *Ph. chinensis*, to ascertain which was the more suitable intermediate host for canine *Leishmania*. Wild flies were collected, and the unfed females were fed on infected dogs, and after 3–8 days were dissected and examined for flagellate development. Whereas the majority of *Ph. sergenti* which contained blood in the mid-gut also contained flagellates, all those without the remains of a blood meal in the intestine were free from infection, and no cases were detected in which the pharynx or proboscis was invaded. In the case of *Ph. chinensis*, several specimens in which the blood meal had been digested still showed flagellate infection, both in the mid-gut and in the rectum, and infections of the pharynx and proboscis were also encountered. It is concluded that *Ph. chinensis* is the more favourable intermediate host.—U. F. RICHARDSON.

TALIAFERRO, W. H., & TALIAFERRO, Lucy G. (1940). **Active and Passive Immunity in Chickens against Plasmodium lophurae.**—*J. infect. Dis.* **66.** 153–165. 3 figs. [20 refs.]

The course of infection in chicks, and the immunity conferred by serum taken from chickens latently infected with *Pl. lophurae*, were studied.

Initial infection was characterized by an acute rise in the number of parasites in the blood, which was terminated by a sharp crisis, and followed by latency within a few days. Latency was not usually interrupted by relapses, but parasites could be demonstrated in blood up to four months in young chickens. There was no marked synchronicity in asexual reproduction.

There was a well defined age immunity to the infection, the younger birds being more susceptible. During latency there was a marked immunity to super-

infection. A high degree of acquired immunity could be passively transferred to normal chickens provided large doses of immune serum obtained from latently infected chickens were continued over the period of normal initial acute rise of infection. The protective action of immune serum was greatly heightened when it was incubated *in vitro* with parasitized red cells before injection. The exact mechanism involved in the action of immune serum was not determined.—K. T. J.

MANWELL, R. D., & GOLDSTEIN, F. (1940). **Passive Immunity in Avian Malaria.** —*J. exp. Med.* **71.** 409–422. 1 table, 4 charts. [19 refs.]

Thirty-two canaries were infected with *Plasmodium circumflexum.* Immune serum, obtained from canaries with chronic infection, was administered before infection, simultaneously with, or after infection. Eighteen of the treated birds did not show parasites, while seven developed a mild infection. Administration of serum before infection was found to be more effective than when given either simultaneously or after infection. The protective substances in the serum of chronic cases were present only in low concentration, but the concentration could be raised by superinfection.

All of the experimental birds developed splenic enlargement, whether they showed clinical evidence of infection or whether clinical signs were absent as the result of the serum treatment; the spleen was similarly enlarged in the birds given normal serum and in those given physiological saline.

When immune serum was added to parasitized corpuscles, they became agglutinated, the reaction being visible under the microscope, but not to the naked eye.—K. T. JOHN.

IVANIĆ, M. (1937). Untersuchungen über die in den inneren Organen der Säugetiere vorkommende parasitäre Zerstörungsarbeit und die damit verbundene multiple Teilung (Schizogonie) bei Piroplasmen der Familie Babesiidae (Piroplasmidae). I–II. [**Destructive Action of Parasites on the Internal Organs of Mammals, and the Associated Schizogony of the Babesiidae. I.** *B. caballi.* **II.** *B. bovis*].—*Cellule.* **45.** 265–290. 2 plates. [12 refs.]

As a result of the examination of sections and smears of splenic material from a horse which had died from *B. caballi* infection and a cow which had died from *B. bovis* infection, it is claimed that these parasites undergo schizogony in the cells of the spleen and that their pathogenic action is due to destruction of the cells of the haemopoietic organs rather than to destruction of the red blood corpuscles. The author was unable to find any evidence of multiplication in the r.b.c. in the case of *B. caballi*, though he admits that such multiplication occurs in the case of *B. bovis*. In the case of *B. caballi* infection, inclusion bodies are described in the blood leucocytes which are interpreted as a babesial invasion. [It is to be noted that these conclusions are drawn from the examination of splenic material from only one animal in each case. The illustrations from the case of *B. caballi* infection are not convincing of a schizogony process, and in the case of the *B. bovis* infection the multiple invasion of the erythrocyte and the appearance of the schizonts suggest a coincident infection with a *Theileria*, a species of which is known to occur in the Balkans].—U. F. RICHARDSON.

BOYNTON, W. H., & WOODS, Gladys M. (1940). **Anaplasmosis Among Deer in the Natural State.**—*Science.* **91.** 168. [3 refs.]

Sporadic outbreaks of anaplasmosis occurred from time to time on cattle ranches in California. Although the source of infection was not established at

first, the local deer were suspected. Many deer had to be killed as their numbers had increased excessively, and blood specimens and ticks, *Dermacentor occidentalis*, were obtained from them at the time of slaughter. Marginal bodies were seen in blood films from three deer. A young cow was inoculated with 10 c.c. of pooled blood from five deer and three days later with 5 c.c. from three deer. After 42 days anaplasms were present in the cow's blood, and thereafter the disease ran its typical course. Recovery was fairly rapid. These facts support the authors' view [*V. B.* **4.** 566.] that deer may act as reservoirs of infection.—M. L. B.

HSIUNG, T. (1938). Biometrische Untersuchungen an den Balantidien des Schweines in der Kultur. [**Biometric Research on Balantidia From Swine**]. —*Z. Parasitenk.* **10.** 108–131. 3 figs., 14 tables. [Numerous refs.]

In order to investigate the variability in pure strains of balantidia, and to find out whether *Bal. suis* is a true species or an atypical form of *Bal. coli*, cultures were inoculated with single organisms, and after eight subinoculations the resulting races were compared. Individual organisms were isolated by Cort and Paynes' method and culture was carried out on Jameson's medium at a temperature of 37°C. It was found possible to maintain a strain for three months.

Variations in length and breadth of individual organisms were not found to be of value in distinguishing *Bal. suis* from *Bal. coli*; considerable variation in these respects occurred in both species even in individuals from the same tube on the same day. The length of one strain of *Bal. suis* varied from 26–113μ and the breadth from 23–74μ, whilst in one strain of *Bal. coli* the length varied from 68–134μ and the breadth from 44–89μ. In both species races were encountered which differed from one another in size.

The ratio of body length to breadth varied in *Bal. coli* from 1·12 to 1·82 and in *Bal. suis* from 1·1 to 2·52, so that if an individual has such a ratio greater than 1·9 it must be *Bal. suis*. Similar specific variation was found to exist in the ratio between the length and breadth of the macronucleus. Other observers have claimed that *Bal. coli* has a bean-shaped macronucleus with a V indentation about the centre whilst the macronucleus of *Bal. suis* is sausage shaped. H. found that strains of *Bal. coli* might have either type of nucleus, but he did not determine whether this indicated that two different species were involved.—U. F. RICHARDSON.

DONATIEN, A., & LESTOQUARD, F. (1940). Rickettsiose bovine algérienne à *R. bovis*. [*Rickettsia bovis* **Infection in Algeria**].—*Bull. Soc. Path. exot.* **33.** 245–248. [5 refs.]

Previous records of *R. bovis* in Algeria refer to a strain introduced by ticks sent from Iran, but four different local strains of the organism have now been encountered in the course of work on piroplasms. The organism occurs in the form of large " initial bodies ", fragmented " initial bodies " and elementary bodies, and it is suggested that it was the failure to realise that the first are a stage in the development cycle of *Rickettsia* that prevented an earlier recognition of the local Algerian infection. The organism only causes a mild febrile reaction in cattle, and in the course of passage it may fail to be apparent in some of the animals, but reappear at a later subinoculation of blood. It was successfully inoculated to sheep in which it was only demonstrable after splenectomy, and also to monkeys in which it caused fever and depression.—U. F. RICHARDSON.

BURNET, F. M., & FREEMAN, Mavis. (1939). **A Comparative Study of Rickettsial Strains from an Infection of Ticks in Montana (United States of America) and from " Q " Fever.**—*Med. J. Aust.* Dec. 16th. 887–891. 3 figs., 1 table. [6 refs.]

The two recently discovered rickettsial diseases, " Q " fever of Queensland and a tick-borne fever of Montana, have been shown to be closely related. As these diseases appear to be indigenous to widely separated localities, the authors considered it of interest to compare them carefully. It was found that there was complete cross-immunity and cross-agglutination. The Montana strain, however, was more pathogenic for g. pigs, mice and two species of monkey. Also it was more readily propagated on the chorio-allantoic membrane where it produced well marked focal lesions, this being unusual for rickettsiae. The authors conclude that both strains should be included in one species.—W. I. B. Beveridge.

Grzycki, S. (1938). Chemische Blutbefunde bei der Urämie im Verlaufe der Leptospirose (Stuttgarter Seuche) der Hunde. **[The Blood Chemistry in Uraemia of Canine Leptospirosis (Stuttgart Disease)].**—*Wien. tierärztl. Mschr.* **25.** 713–719. 2 tables. [Numerous refs.]

An account is given of the results of the examination of 26 sera obtained from dogs in advanced stages of the disease (with and without jaundice). A feature of diagnostic and prognostic value was the increase in P content, which was constant and was especially marked in grave cases. There was first hypoglycaemia and later, 1–2 days before death, hyperglycaemia. Residual nitrogen was increased and alkalinity decreased. Hypocalcaemia was frequent but appeared to be in no way connected with the increased P content.—V. Chládek.

Das Gupta, B. M. (1940). **Natural Leptospiral Infection in the Rat Population of Calcutta.**—*Indian med. Gaz.* **75.** 284–286. [6 refs.] [Author's summary copied *verbatim*].

The kidney substance of 310 wild rats trapped in different parts of the city of Calcutta, especially in the infested areas, were examined by the dark-ground illumination and by animal inoculations. One hundred of these specimens were also cultured on Vervoort's medium. Besides, 100 samples of sera from these animals were tested for agglutinating and lytic effects on a strain of leptospira isolated locally from a human case. Leptospirae were detected in the kidneys of 5 animals. Two other animals gave serological evidence of leptospiral infection. A strain of rat leptospira was isolated by animal inoculation and identified. It was found to be homologous with the classical *L. icterohaemorrhagiae* strain which is responsible for infection in man in most cases in Calcutta. The animals which showed leptospirae in their kidneys were identified as *Mus decumanus* Pallas—3 specimens, *Rattus rattus rufescens* (Gray) and *Bandicota elliotana* Anderson—one each.

Marchoux, E., Chorine, V., & Crougue, O. (1939). Virulence des cultures de *Spirochaeta gallinarum* au stade invisible. **[Virulence of Cultures of *Sp. gallinarum* at the Invisible Stage].**—*C. R. Soc. Biol. Paris.* **131.** 865–867. [3 refs.]

The authors record an experiment conducted to investigate the virulence of *Sp. gallinarum* when in the apparently invisible state.

Sections of the feet of five infected *Argas persicus* were made to obtain body fluid, which had been shown by Couvy frequently to harbour spirochaetes. After examination to ensure that no spirochaetes could be detected microscopically, cultures were sown with this body fluid and incubated, and experimental birds were inoculated with varying dilutions. A dilution of 0·01 c.c. of the incubated culture was found to be sufficient to kill an experimental bird in approximately five days. A 0·001 c.c. dilution was sufficient to give a feeble immunity to subsequent inoculation with a virulent culture.

The authors conclude that on this evidence they are satisfied that spirochaetes multiply both in the invisible and spiral forms.—G. C. BRANDER.

DISEASES CAUSED BY VIRUSES

SCHMIDT, S. (1939). Om Adsorption af Ultravirus. **[The Adsorption of Ultravirus].**—*Medlemsbl. danske Dyrlaegeforen.* **22.** 1–8. [13 refs.]

A general review of the adsorption of viruses and toxins on to $Al(OH)_3$ and other substances, the properties of adsorbates and their use in immunization with special reference to F. & M. disease. Trivalent adsorbate vaccines (prepared from mixtures of types A, O and C of the F. & M. virus) have been successfully used. —J. E.

SANDERS, M. (1939). **Cultivation of the Viruses. A Critical Review.**—*Arch. Path.* **28.** 541–586. 3 tables. [Numerous refs.]

S. lays down certain standards which should be accepted as minimal requirements for judging whether viruses have been successfully grown in tissue culture. These include precautions to ensure that apparent propagation is not due to survival of the virus, proof of increase in potency and the absence of bacterial infection or the appearance of spontaneous viruses. The application of these criteria to the viruses which are believed to have been cultivated, has enabled two lists to be drawn up, one containing 18 viruses which satisfy all these criteria, and the other containing 11 viruses in which the evidence is doubtful.—R. E. GLOVER.

POLSON, A. (1940). **Electrophoresis of Animal Viruses and their Neutralizing Antibodies in Low Concentrations. [Correspondence].**—*Nature, Lond.* **145.** 27. 1 fig. [7 refs.]

The method used is a modification of the Tiselius moving boundary method. Two reversible silver : silver chloride electrodes are employed, and by an ingenious device the saturated KCl solution which surrounds them is separated from the virus solution in the U tube by a buffered solution, which has been dialysed against the solution under test. The current is switched on and by the means of two taps samples of the test solution can be removed from either arm of the U tube.

Using this apparatus an extensive study, which will be published in the *Onderstepoort Journal of Veterinary Science and Husbandry*, has been made of the electrophoresis of viruses and their neutralizing antibodies.—JOHN FRANCIS.

HABER, P. (1939). Interdépendance du degré de virulence de la glande séminale et du neurotropisme dans quelques maladies expérimentales à ultravirus. **[Interdependence of Neurotropism and the Virulence of Testicular Tissue in Certain Ultravirus Infections].**—*C. R. Soc. Biol. Paris.* **130.** 1534–1535. [1 ref.]

Mice were inoculated intracerebrally with the viruses of St. Louis encephalitis, louping ill and fowl plague respectively. After death their testicles were titrated in mice. It was found that the three viruses showed the following infectivity :– St. Louis, 1 : 2 ; louping ill, 1 : 50, and fowl plague, 1 : 250.

It appears, therefore, that the virulence of the testicular tissue was inversely proportional to the neurotropism of the viruses under study.—R. E. GLOVER.

SCHMALTZ, R. (1939). Die Maul- und Klauenseuche-Epidemie. **[The Outbreak of Foot and Mouth Disease].**—*Berl. Münch. tierärztl. Wschr.* Feb. 17th. 110–112. 1 table.

Accurate statistical data are given on the spread of F. & M. disease in the various administrative districts of Germany from October 1st, 1937 to January 1st, 1939. A table gives details of the paths by which the disease spread as well as of its course. September 1st, 1938, is given as the turning-point of this great epizootic; from that day onward there was a steady fall in the number of outbreaks. There were 20,699 infected farms on January 1st, 1938; the peak was reached on August 1st, 1938 with 138,446, and on January 1st, 1939 the total of infected farms had dropped to 19,291.—V. CHLÁDEK.

GÖTZE, R. (1939). Die klinische Seite der Maul- und Klauenseuche. **[The Clinical Side of Foot and Mouth Disease]**.—*Dtsch. Tierärztebl.* **6.** 2–5. 12 figs. on 2 plates.

Correct treatment and care of the affected animals can greatly reduce economic losses, and should not be neglected in countries where the strict slaughter-out policy is not adopted. Advice as to treatment is given.

In addition to measures of veterinary control, affected animals usually kept in the open should be stabled, suitably fed, their straw frequently changed, their mouths washed daily, their claws treated with an ointment (once only) and bandaged, and their udders carefully looked after (washed, dressed with cod-liver oil and milked with care). In this manner any undesirable complications can be avoided.—V. CHLÁDEK.

I. OELLER. (1939). Erkrankung von Pferden an Maul- und Klauenseuche. **[Infection of Horses with Foot and Mouth Disease]**.—*Berl. Münch. tierärztl. Wschr.* June 9th. 360–361.

II. BRANDT, A. (1939). Erkrankung von Pferden an Maul- und Klauenseuche. **[Infection of Horses with Foot and Mouth Disease]**.—*Ibid.* June 23rd. 394. [5 refs.]

I. O. describes what he considers to be the clinical signs of F. & M. disease in three horses in contact with cattle believed to be affected with the disease. No thermal reaction and no foot lesions were noted, and nothing other than clinical evidence is adduced.

II. B. considers OELLER's [see I] diagnosis to have been inaccurate. He describes a comparable condition met with as a result of feeding on Swedish clover (*Trifolium hybridum*). The lesions described included desquamation of areas of epithelium of the tongue in a similar manner to that found by OELLER in his cases.
—J. B. BROOKSBY.

PANISSET, L. (1939). Les enseignements de la récente épizootie de fièvre aphteuse. Observations et recherches. **[The Lessons Taught by the Recent Outbreak of Foot and Mouth Disease]**.—*Rec. Méd. vét.* **115.** 784–825. 1 table. [Numerous refs.]

P. describes the progress of the recent European epizootic of F. & M. disease and its economic consequences. He then reviews many aspects of F. & M. disease in considerable detail, dealing with the subject under the following headings:– (1) Factors affecting the susceptibility of animals to F. & M. disease. Well nourished animals are more susceptible and this may account for the occurrence of epizootics in tropical countries where there is a seasonal variation in the state of nutrition. (2) The physical and biological properties of the virus including its cultivation in the chorio-allantoic membrane of the chick. (3) The difficulty of establishing the antigenic type of the virus by g. pig tests. (4) The question of carriers, resistance of the virus and methods of spread. (5) The symptoms in

different animals and the species which can be infected. Cold generally prolongs the period of incubation and reduces the severity of the disease. (6) Active immunity following natural and artificial immunization, most attention being paid to Waldmann's method. (7) Passive immunization with hyperimmune serum and convalescent blood, serum or plasma. (8) Sanitary measures of control, including the value of the slaughter policy, and (9) Transmission of the disease to man. [The review is very complete and many references are given. It should be read by anyone interested in F. & M. disease as the subject matter cannot be adequately abstracted].—JOHN FRANCIS.

MØLLER, R., & THOMSEN, A. (1938). Om Anvendelse af Mund- og Klovesyge-Rekonvalescentblod fremstillet i Dyrlaegepraksis. **[The Use of Foot and Mouth Disease Convalescent Blood Prepared in the Field].**—*Maanedsskr. Dyrlaeg.* **50.** 454–463. 1 fig., 1 table. [3 refs.]

A detailed account of the preparation of citrated convalescent blood and its use in the field. Antiseptic methods were used for the glass and other apparatus, 0·5% chloramine being used to disinfect the bottles, 1% chloramine for the tubing, etc., and 0·125% chinosol for the drawn blood. Injections were made by one of three routes—the subcutaneous, intraperitoneal and intravenous—, doses for adult cattle being 300–400 c.c. The authors administered bovine citrated blood to pigs and sheep as well as to cattle, without any undesirable complications arising.—J. E.

MENK, W. (1938). Die seuchenhafte Encephalomyelitis der Pferde in Amerika. **[Equine Encephalomyelitis in America].**—*Behring.-Mitt.* **9.** 127–149. 1 table.

A detailed review of the knowledge up to and including 1937 of North and South American equine encephalomyelitis, with notes on M.'s experience of the Argentine form.—J. E.

SLAVIN, G. (1938). **The Resistance of the Swine Fever Virus to Physical Agencies and Chemical Disinfectants.**—*J. comp. Path.* **51.** 213–224. 3 tables. [13 refs.]

By the addition of acid or alkali, 50 c.c. amounts of swine fever serum, diluted 1 : 10 with distilled water, were adjusted to pH values within the range of 1·4–13·0 as measured by a Cambridge electrometer valve pH meter. The injection of 18 pigs with 1 c.c. of virus samples treated by this method, showed that a pH of 1·4 or 13·0 was necessary to destroy the virus in one hour. Soft red brick slabs and chopped hay samples, soaked with 5% S.F. spleen suspension and dried *in vacuo* over calcium chloride, were exposed to the air in a louvered box affording protection from light and rain. Injection of eight pigs with saline extracts of powdered brick or ground hay, after given intervals of exposure, demonstrated that the virus survived for seven but not for 14 days. S.F. spleen-faeces suspensions of normal faecal moisture content were exposed to certain dilutions of various disinfectants for different intervals, followed by rapid filtration through glass wool, and injected into pigs, 52 being used altogether. It was found that 5% phenol solution, and hypochlorite solution containing 1·66% available chlorine, each destroyed the virus in 15 minutes.

In subsidiary experiments pigs were found to be resistant to infection with S.F. by ingestion (10 c.c. of 5% spleen suspension) and by conjunctival or nasal instillation (few c.c. of spleen-faeces mixture).—R. O. MUIR.

GEIGER, W. (1938). Versuche mit Kristallviolett-Vaccine nach Dorset bei Virus-Schweinepest. **[Trials of Crystal Violet Vaccine against Swine Fever]**.—*Behring.-Mitt.* **9.** 78–93. 4 tables. [9 refs.]

Three separate lots of vaccine prepared from the blood of pigs killed at the height of acute S.F. were treated by Dorset's method to produce a vaccine containing 5% of a 1% crystal violet solution. Each batch of vaccine was tested on 18 test pigs, six of which received the crystal violet vaccine, six the crystal violet vaccine plus 0·1% disodium phosphate and six the crystal violet vaccine plus 0·1% phenol. These three types of vaccine were kept in an incubator at 37°C. before use and were given to pigs after various intervals of storage ranging from 1 to 125 days. Of the test pigs vaccinated with the first batch of vaccine, ten died as a result of vaccination, five of the survivors succumbed to test infection and three proved immune to test infection. Two pigs vaccinated with the second batch of vaccine died from the effects and 16 proved immune to test infection. Eight pigs vaccinated with the third batch of vaccine died from the effects, two succumbed to test infection and eight proved immune.

There was no significant difference between the effects of the three types of vaccine. Fresh vaccine appeared to be more efficacious than vaccine kept for more than one week.—P. S. WATTS.

JACOTOT, H. (1940). La vaccination contre la peste porcine au moyen d'émulsions organiques avirulentes. (Deuxième note). **[Vaccination against Swine Fever with Avirulent Organ Emulsions. II]**.—*Bull. Acad. vét. Fr.* **13.** 50–54. [1 ref.] [For part I, see *V. B.* **8.** 288].

Statistics are given which appear to justify the use of avirulent formolized tissue vaccine for S.F. prophylaxis. Favourable results were obtained by the vaccination of over 3,000 pigs in France, about 4,000 in Indo-China, and also of Berkshire breed breeding stock in Cochin-China where the vaccination of piglets after weaning reduced mortality due to S.F. from 40% to 2%. Vaccination of 19 piglets with 12–15 c.c. of organ emulsion and of ten adult pigs with 30 c.c. produced an immunity lasting up to six months in the former and one year in the latter. A comparison in 18 piglets of the immunizing value of spleen, lymph nodes, bone marrow and lung showed that the latter had some value for vaccine preparation, but was less potent than the other three tissues.—R. O. MUIR.

CHAVEIRO REBELO, C. P. (1938). Vaccinação contra a peste suína pelo método de Terakado. **[Terakado's Method of Vaccination against Swine Fever]**.—*Repos. Lab. Pat. vet., Lisboa.* **3.** 225–229. [English and French summaries].

The vaccine referred to is prepared from suspensions of spleen, kidneys and lymph nodes of pigs with the acute form of S.F., strained through a wire gauze and held at 37°C. for 48 hours [see also *V. B.* **6.** 231].

R. made this vaccine using 0·2% formol. It was inoculated subcutaneously into three groups of pigs (6, 4, 6), the dosage varying from 0·5–3 c.c. per 3·75 kg. live weight. All the pigs were later infected with virus. Of the first group, four developed symptoms of S.F.; of the second group, one died and two others showed symptoms but recovered; of the third group, three injected after 22 days with live virus died, and of the remaining three placed in contact with known S.F. cases, two died, one recovering after showing symptoms.

R. agrees with DONATIEN and LESTOQUARD that the virus of S.F. does not lend itself to conversion into a safe vaccine.—J. PASFIELD.

Koch, K. R. (1938). Die Tollwut der Rinder und Einhufer in Südamerika. [**Rabies in Cattle and Solipeds in South America**].—*Behring.-Mitt.* **9.** 122–126.

A review of present knowledge. The disease is controlled by immunization with glycerin-phenol brain tissue vaccine, attenuated by 24 hours at 42°C.—J. E.

Molina, A. (1938). Profilaxia da raiva pela vacinação. [**Results of Vaccinating Cattle against Rabies in Brazil**].—*Bol. Soc. brasil. Med. vet.* **8.** 103–106. 2 tables.

In heavily infected farms three consecutive inoculations at intervals of less than a year were found to confer useful immunity against natural infection. In lightly infected farms, one inoculation was sufficient to eradicate the disease. Fresh, unattenuated vaccine (24 hours old) given in doses of 20–40 c.c. to adult cattle was well tolerated and conferred a sufficiently useful immunity. Vaccine 40 days old was found to be useless. There were 1·5 % losses in vaccinated herds within 30–60 days after vaccination. M. suggests that this loss may be explained by the fact that the strength of the immunity conferred depends upon the amount of nervous material in the vaccine. He noted, in this respect, that the larger the dose of vaccine, the more solid was the immunity.—S. Torres.

Denison, G. A., & Leach, C. N. (1940). **Incidence of Rabies in Dogs and Rats as Determined by Survey.**—*Amer. J. publ. Hlth.* **30.** 267–269. 1 fig., 1 table.

Surveys were undertaken in Birmingham, Ala., to determine the prevalence of rabies. Five hundred rats were trapped, their brains were removed and pooled, and material from this mixture was used for mouse infection tests. None of the mice developed rabies, and it was concluded that the rat did not play an important part in the transmission of rabies in Birmingham.

Among 11,201 dogs that died or were killed, 352 were suspected of rabies. Of these 352, rabies was diagnosed in the laboratory in 232. 533 apparently healthy brains were examined to determine the prevalence of rabies among dogs not suspected of having the disease ; five were found to be positive.

There was a greater incidence of rabies among dogs owned by negroes than among those of other owners [see also *V. B.* **10.** 672].—K. T. John.

Carneiro, V. (1938). Sobre a ausencia do virus da doençã de Aujeszky no cerebro dos animaes. [**The Absence of Virus from the Brains of Animals Infected with Aujeszky's Disease**].—*Arq. Inst. biol., S. Paulo.* **9.** 233–252. 6 tables. [11 refs.] [English summary].

Having infected a large number of experimental animals with the virus of Aujeszky's disease, and having examined several cases of natural infection, C. noted that virus was frequently absent from the cerebrum of animals which died of the disease. In cases where the animal was inoculated near the head, virus was found in the cerebrum, but where inoculation was in a posterior part of the body, virus was usually found in the lumbar medulla but not in the cerebrum. In every case the virus was found in highly innervated tissue near the seat of inoculation.

The virus may also be absent from the blood and from serum withdrawn from the inoculation area. C. insists on the necessity of obtaining virulent material from nervous tissue near the seat of inoculation and preferably from the spinal medulla nearest that point.

From his experiments it seems clear that the animal may die before the virus reaches the cerebrum.—Miller Watson.

REMLINGER, P., & BAILLY, J. (1939). Transmission de la maladie d'Aujeszky au dindon. [**Transmission of Aujeszky's Disease to Turkeys**].—*Bull. Acad. vét. Fr.* **12.** 362–365. 2 figs.

The authors have previously shown that Aujeszky's disease is transmissible to the duck, fowl, pigeon, goose, buzzard and sparrow hawk. They now show that turkeys are very susceptible and describe the syndrome in inoculated turkeys. Brain tissue of infected turkeys, but not their blood, produced typical disease in rabbits. Two guinea fowls were not susceptible to repeated inoculations of large doses of infective rabbit tissue.—C. V. WATKINS.

ENDERS, J. F., & HAMMON, W. D. (1940). **Active and Passive Immunization Against the Virus of Malignant Panleucopenia of Cats.**—*Proc. Soc. exp. Biol., N.Y.* **43.** 194–200. 2 tables. [8 refs.]

A common, acute infectious disease of cats characterized by intranuclear inclusion bodies, decrease in the number of lymphocytes and granulocytes of the blood, and an extensive aplasia of lymphoid tissue and of the bone-marrow, including erythropoietic elements has recently been described by the authors [*V. B.* **9.** 625, and **10.** 606.], who showed that the causal agent was filtrable. It appears that the disease occurs in Canada, Germany, Russia and possibly South America. The authors now present evidence which suggests that injection of formalinized suspensions of organs from infected cats, or the serum of cats convalescent from the infection, or that of cats vaccinated with formalinized material and then inoculated with living virus, induces resistance in susceptible cats against a subsequent injection of virus.—J. A. GRIFFITHS.

PERRIN, T. L., & OLIPHANT, J. W. (1940). **Pathologic Histology of Experimental Virus Influenza in Ferrets.**—*Publ. Hlth Rep. Wash.* **55.** 1077–1086. 6 figs. on 2 plates. [8 refs.] [Authors' summary copied *verbatim*].

The intranasal inoculation of influenza virus in ferrets while under ether anesthesia produced definite pathologic alterations in the nose and lungs; these alterations have been described. No lesions which could be definitely attributed to the influenza virus were seen in mediastinal lymph nodes, heart, liver, spleen, kidneys, or adrenals.

GAUDUCHEAU, A. (1939). Transformation du virus varioliques. [**Changes in the Smallpox Virus**].—*Bull. Soc. Path. exot.* **32.** 580–583. 1 fig. [6 refs.]

In view of the recent publication by GASTINEL and FASQUELLE [*C. R. Soc. Biol. Paris.* **130.** 1554.] that passage of smallpox virus in the chick embryo causes a tendency to generalization, G. discusses work he has done concerning this problem. Experiments are quoted to show that generalization is dependent on associated bacteria which also increase immunity. Purified virus has little tendency to generalization. Changes in the virus by passage through young animals have been described by several authors.—S. J. GILBERT.

BLATT, M. L., ZELDES, Mary, & STEIN, A. F. (1940). **Chickenpox Following Contact with Herpes Zoster. Report of Two Minor Epidemics.**—*J. Lab. clin. Med.* **25.** 951–955. [16 refs.] [Authors' summary copied *verbatim*].

1. Two minor epidemics of chickenpox following herpes zoster are reported.
2. These episodes differ from the usual chickenpox epidemics in that so few secondary cases occurred among so many children exposed. It would seem that chickenpox follows exposure to herpes zoster in comparatively few instances. On the other hand, exposure to chickenpox has usually been followed by an epidemic in our institution,

AMBROSIONI, P. (1938). Culture du virus de la peste aviaire sur la membrane chorion-allantoïdienne de l'embryon du poulet. (Note préventive). **[Cultivation of the Fowl Plague Virus on the Chorio-Allantoic Membrane of Hens' Eggs].**—*Boll. Sez. ital. Soc. int. Microbiol.* **10.** 141–143. [In French]. [Also appeared in *Clin. vet. Milano.* **61.** 539–541].

A. describes the cultivation of fowl-plague virus on the allantoic membrane. No new information is provided.—G. C. BRANDER.

DELBRÜCK, M. (1940). **Adsorption of Bacteriophage Under Various Physiological Conditions of the Host.**—*J. gen. Physiol.* **23.** 631–642. 4 figs., 3 tables. [6 refs.] [Author's summary copied *verbatim*].

1. The adsorption rate constant of phage to bacterium is found to change between wide limits, depending on the physiological state of the bacterium.

2. The experiments of Kreuger and of Schlesinger on the residual free phage in contact with an excess of bacteria are discussed and the view of Schlesinger, that they represent phage particles with reduced affinity to the bacterial host is supported by experiments.

3. The theory of von Smoluchowski and Schlesinger is compared with the experiments.

4. The implications of these findings for the assay methods currently used are discussed.

DELBRÜCK, M. (1940). **The Growth of Bacteriophage and Lysis of the Host.**—*J. gen. Physiol.* **23.** 643–660. 7 figs., 3 tables. [13 refs.] [Author's summary copied *verbatim*].

1. A new strain of *B. coli* and of phage active against it is described, and the relation between phage growth and lysis has been studied. It has been found that the phage can lyse these bacteria in two distinct ways, which have been designated lysis from within and lysis from without.

2. Lysis from within is caused by infection of a bacterium by a single phage particle and multiplication of this particle up to a threshold value. The cell contents are then liberated into solution without deformation of the cell wall.

3. Lysis from without is caused by adsorption of phage above a threshold value. The cell contents are liberated by a distension and destruction of the cell wall. The adsorbed phage is not retrieved upon lysis. No new phage is formed.

4. The maximum yield of phage in a lysis from within is equal to the adsorption capacity.

5. Liberation of phage from a culture in which the bacteria have been singly infected proceeds at a constant rate, after the lapse of a minimum latent period, until all the infected bacteria are lysed.

6. If the bacteria are originally not highly in excess, this liberation is soon counterbalanced by multiple adsorption of the liberated phage to bacteria that are already infected. This leads to a reduction of the final yield.

PARASITES IN RELATION TO DISEASE [ARTHROPODS]

WATERHOUSE, D. F. (1939). **Temperature Preference in the Australian Sheep Blowfly, Lucilia cuprina Wied. [Correspondence].**—*Aust. J. Sci.* **2.** 31–32. 2 figs. [1 ref.]

It was observed that when *L. cuprina* was liberated in a large muslin cage heated by a radiator placed outside the cage and some 2 ft. distant from it, the

flies tended to settle in a circular zone on the side of the cage next to the radiator. The observations were made in fairly dim artificial light, as in brighter light the flight-activity of the flies was such that no definite zone of settlement could be observed. By hanging thermometers on the side of the cage, it was found that the zone selected for settlement by *L. cuprina* ranged from 31·5°–38°C. Factors other than the recorded temperature which may have influenced the flies' settlement and their choice of this zone, are discussed.—D. A. GILL.

NYASALAND PROTECTORATE. (1939). **Annual Report of the Medical Entomologist for 1938.** [LAMBORN, W. A. S.]—*Annu. med. Rep. Nyasald. 1938.* pp. 40–48. [3 refs.]

The results are detailed of two surveys for tsetse flies carried out during the year. A survey in the Dowa district showed that the effect of economic development of the area examined, where since 1929 large areas have been opened up by the clearing of land for cotton cultivation, has been a sharp reduction in the number of tsetse. L. found that in three out of four "primary centres", described by SHIRCORE (1914), tsetse were non-existent, but that they still occur sparingly in the fourth. The improvement is, therefore, very definite and is confirmed by the reintroduction of livestock that is now taking place, this having been impossible for many years before. L. stresses the need for further development in the area of the fourth primary centre and the elimination of game which he suggests could be speeded up by the suspension of the game protection laws.

A survey was made to ascertain the tsetse position on the Kasungu plain where the district commissioner's report inferred that forest preservation measures were causing spread of tsetse. The report stated that the area had at one time supported a number of cattle but that in recent years there had been considerable forest regeneration and presumably as a result fly had gradually advanced and cattle disappeared. The veterinary reports show that the 3,635 cattle of 1927 had dwindled to 1,687 in 1936, presumably from trypanosomiasis, since the widespread incidence of this disease is recorded among the survivors. L. found that the main factors causing the spread of the fly were the reversion of the plain to bush sufficient to provide shade conditions for flies (the cause of this being the gradual depopulation of the plain), and the existence of the larger wild mammalia. He recommends deforestation, particularly in the vicinity of villages, the suspension of the game laws with more effective control of elephants, greater effort to conserve the existing livestock, the settlement of native immigrants where deforestation is specially needed and consideration of the possibilities of greater economic development of the plain.—J. A. GRIFFITHS.

LEBERT, F. (1939). Gasterophilus inermis Brauer et son rôle pathogène. La dermite estivale des joues du cheval. [**Summer Dermatitis of the Cheek in Horses Caused by** *G. inermis*].—*Thesis, Alfort.* pp. 93. 5 figs. [Numerous refs.]

This thesis consists mainly of a critical review of the literature on *G. inermis.* In addition to the pathological aspects, it deals with classification, morphology, biology, treatment and prophylaxis, and geographical distribution. Particular attention is paid to the role of first stage larvae in the aetiology of summer dermatitis of the cheek in horses.

L. describes observations which show that parasitism of the rectum by *G. inermis* usually accompanies summer dermatitis. In four out of five affected animals, larvae were discovered in the rectum.

The following are the main conclusions :– (1) the larvae spend a part of the

second stage and the whole of the third stage in the rectum ; (2) oviposition is confined to the cheeks ; (3) summer dermatitis of the cheek in horses is caused by *G. inermis* ; (4) the lesions of summer dermatitis in France are not serious ; the parasite causes prolapse of the rectum in North Africa where infestation is more intense owing to the heat, and (5) *G. inermis* occurs throughout Central Europe and seems to be spreading in France from east to west.—R. P. Hobson.

Warburton, C. (1940). **Annual Report for 1939 of the Zoologist.**—*J. R. agric. Soc.* **100.** Pt. III. 139–141.

Notes upon the recorded hosts and the seasonal incidence of *I. ricinus* in Great Britain are given.—Walter Moore.

PARASITES IN RELATION TO DISEASE [HELMINTHS]

Srivastava, H. D. (1939). **The Important Helminth Parasites of Horses—Their Treatment and Control.**—*Indian J. vet. Sci.* **9.** 309–322. 5 figs. on 2 plates.

S. affirms that more damage is done to the general health of horses in India by worms than by all the other causes of disease combined, and, after describing the general symptoms of helminthic infestation, stresses the necessity of effective treatment. Concise details are given of the life cycle, predilection site, pathogenicity, symptomatology, treatment and/or prophylaxis of the more important species of flukes, tapeworms, oxyurids, large and small strongyles, lungworms, large stomach worms and thread worms. Brief reference is made to the neck thread worm (*Onchocerca cervicalis*), eye worms and microfilariae. Only those methods of treatment which have been proved to be effective against the parasite or parasites involved are recommended.—J. R. Lawson.

Robertson, D. (1939). **Helminths from Hill Sheep.**—*Scot. J. Agric.* **22.** 231–235. 2 tables. [1 ref.]

This paper presents the results of a survey, supplementary to that already undertaken by R., on Scottish sheep parasites [see *V. B.* **10.** 680]. Autopsies were performed on eleven lambs and 20 ewes ; all, except five of the lambs, came from Argyll.

The lambs were found to carry 14 species of helminths, of which twelve were nematodes and two were cestodes. The heaviest infestations were with *Ostertagia* spp., and *Bunostomum trigonocephalum.* The sheep carried the same species as the lambs and, in addition *Capillaria longipes* and *Fasciola hepatica. Trichostrongylus vitrinus* was present in large numbers. Lungworms were not found.

As the hill pastures were not overcrowded, R. attributes the heavy infestations to the animals' habit of repeatedly grazing the same areas of grass. Worms are probably acquired from the lowland pastures where the sheep pass the winter.

R. deprecates the practice of crowding hill lambs on to pasture of poor quality near the farms during the weeks before sales, since the animals often actually lose condition from poor nutrition and increased worm infestation.—E. S.

Orlov, I. V. (1937). Novoe v bor'be s hel'mintozami ovets. **[Control of Helminth Parasites in Sheep].** pp. 37. 4 figs., 12 tables, 1 photograph. Moscow : Sel'khozgiz. [8vo].

This booklet of 37 pages is an account of the work done in connexion with the eradication of helminth infestations of sheep in the U.S.S.R. between 1930 and 1936. There is a detailed description of the methods used for diagnosis during

life and of the therapeutic and preventive measures applied. [See also *V. B.* **3.** 489].

Treatment for *Dictyocaulus filaria* infestation was by intratracheal injection of iodine, the animal being placed on its back on a sloping bench forming an angle of 30°–40° with the ground, the head being at the top and propped up by a ledge let into the bench. O. claims that this position, introduced by him, facilitates the penetration of the remedy to all parts of the lungs. He gives three figures to demonstrate the advantages of this procedure. Hall's copper sulphate method was used in the treatment of *Haemonchus* and *Moniezia* infestation.

Much space is devoted to a description of large-scale helminth eradication experiments on two sheep-breeding farms involving more than 50,000 head. After anthelminthic treatment, a scheme of pasture rotation was introduced, according to which the sheep were grazed only five days on the same pasture section, each section being used for the grazing of sheep only once or twice in the year.

As a result of these measures, the proportion of *D. filaria* infestation decreased from 35·7 %–2·7 % in the course of one year. O. attributes this striking improvement almost exclusively to the five-day change of pasture, as contrasted with the ten-day change advocated by other workers and which he formerly practised. Control herds treated for helminths, but not kept on this rotation, showed only a very slight decline in infestation.

Although the rainfall in 1934 was heavy and hence conditions were favourable to the development of worms, losses from helminth infestation in that year fell from 15 % to 5 % in adult sheep and from 58 % to 5·8 % in lambs. In the following year (1935) lamb mortality from this source declined further to 4·6 %, a circumstance which O. attributes to the increased resistance of the lambs to other helminths after *D. filaria* and *H. contortus* had been controlled.

Further indications of the beneficial effects of the scheme were a rise in the lamb crop from 37·5 per 100 of mated ewes in 1933 to 125 in 1935, and an increase in the fleece per head by roughly 28 % and in the average weight of ewes and rams by 8–17 % and 3–8·3 % respectively. The proportion of surviving lambs per 100 lambing ewes increased from 126 in 1933 to 146 in 1935.

The five-day change practically eradicated *Dictyocaulus*, *Haemonchus*, *Chabertia* and *Nematodirus*. *Trichostrongylus*, *Ostertagia* and some other strongyles were, however, only decreased in numbers and it is suggested that this was because the larvae of these worms reach the infective stage in less than five days. O. believes, however, that in spite of this there is no need to shorten the rotation period as *Trichostrongylus* and *Ostertagia*, being less pathogenic for sheep than other Trichostrongylidae or Strongylidae, cause no appreciable losses. Although sheep grazed with a five-day rotation require a pasture area about one-third larger than usual, waste can be avoided by cutting the grass for hay, grazing horses and cattle intermittently on the pastures and grazing the sheep on stubble when available.

The Orlov scheme has now been recommended by the Russian veterinary authorities for adoption on all sheep-breeding establishments in the U.S.S.R.

—E. Martin.

Culbertson, J. T. (1938). **Recent Contributions to the Immunology of Helminthic Infections.**—*Arch. Path.* **25.** 85–117 and 256–280. [Numerous refs.]

A summary of work on helminth immunity since 1929, when a monograph was published by Taliaferro ["The Immunology of Parasitic Infections." pp. 414. New York: Century Co.]. The material cannot be satisfactorily condensed into an abstract, and interested readers should consult the original.

Some of the main points considered are :– natural immunity of species, and of breeds and strains within the species ; age immunity (especially as shown by dogs to *Ancylostoma caninum* infection) ; acquired immunity, by infection (chiefly somatic and blood parasites), by artificial immunization (particularly various taenioid cestodes and *Trichinella spiralis*) and by passive transfer of immunity, by blood serum, or through the placenta or milk of an infected mother ; the effect on immunity of intercurrent infections, and of diet, pregnancy or haemorrhage ; the influence of immunity on the number, size, rate and extent of development of parasites, and on their egg production ; relative importance of antibodies and of cellular agencies in the control of parasites ; and the use of immunological reactions in the classification of helminths and in the diagnosis of infection, the latter including intradermal reactions, and precipitin and complement-fixation tests.

C. urges the importance of further work on the relation existing between genetic constitution and natural immunity.

His general conclusion is that the various phenomena of immunity against helminths are so nearly identical with those associated with other types of infectious agents, that one must either accept the idea of helminth immunity or refute the whole conception of immunity to disease agents.—E. S.

SRIVASTAVA, H. D. (1939). **Occurrence of Liverfluke,** *Fasciola gigantica*, **in the Lungs of Goats.**—*Indian J. vet. Sci.* **9.** 223–224.

Eggs of *F. gigantica* were found in one sample of nasal discharge during the course of examination of goats suffering from pulmonary strongylosis. Specimens of *F. gigantica* were later recovered from the lungs. The author comments upon this incidence in an unusual site.—M. L. BINGHAM.

BAUDET, E. A. R. F. (1939). Gehäuftes Sterben bei Tauben durch Cotylurus cornutus. [**Deaths in Pigeons Caused by** *C. cornutus*].—*Z. InfektKr. Haustiere.* **55.** 244–251. 3 figs. [4 refs.]

The paper deals with an outbreak in 80 carrier pigeons. Of 32 which were used daily for carrying purposes 20 died in a few weeks. The intestinal mucosa was found P.M. to be covered with a large number of parasites. A piece of intestine, 10 cm. long, taken from each of 19 pigeons yielded a total of 15,000 parasites. In several birds the intestinal mucous membrane was spotted with blood. Ailing pigeons were affected with catarrhal enteritis and blood-stained faeces were seen in a few of them. The owner had also 60 fancy pigeons, and as these remained free from infestation it was concluded that the carrier birds must have been infested during their flights. It was shown experimentally that pigeons consume *Stagnicola palustris*, the vector of *C. cornutus*, and ten specimens of this snail were found in the crop of one of the pigeons. Furthermore, a three-weeks-old pigeon was shown P.M. to be infested although it was unable to fly. It must, therefore, have become infected by taking infested snails from the mother pigeon's crop during feeding.—A. L. WILSON.

GORDON, H. McL. (1939). **A Note on the Experimental Transmission of** *Cysticercus ovis*.—*Aust. vet. J.* **15.** 125–126. [3 refs.]

The successful transmission of *Taenia ovis* to a dog by feeding with *C. ovis* cysts from a sheep is recorded and also the subsequent transmission of *C. ovis* to sheep by feeding with eggs of the tapeworm recovered from the dog. In infested sheep the great majority of cysts were degenerate and sterile.

CAUCHEMEZ, NAIN, & PRUDHOMME. (1939). La ladrerie des petits ruminants. Un cas de ladrerie ovine. [**Cysticercosis in Small Ruminants. A Case in a Sheep**].—*Bull. Acad. vét. Fr.* **12.** 339–346. [Numerous refs.]

The authors review references to cysticercosis of reindeer (*C. tarandi*), roe-deer (*C. cellulosae*), goats (doubtful findings including *C. tenuicollis* and *C. balloni*) and sheep (*C. ovis*, *C. tenuicollis*, *C. cellulosae* and *C. balloni*). Of the four sheep parasites, *C. ovis* is readily distinguished by its situation in muscles, whereas *C. tenuicollis* is to be found in the peritoneal cavity. A case is described in a sheep from a Paris abattoir in which cysts were found embedded lengthways, about 2 in. apart, between the fibres of the shoulder and brisket muscles. The condition was ascribed to *C. ovis* infestation. Confirmation of this by feeding cysts to dogs was not attempted.—C. V. WATKINS.

DE WAELE, A., & DE COOMAN, Elisabeth. (1938). Pourquoi la résistance du lapin à l'inoculation de sable échinococcique de kystes hydatiques de cheval n'est-elle pas absolue. [**Lack of Absolute Immunity in the Rabbit to Echinococci from the Horse**].—*C. R. Soc. Biol. Paris.* **128.** 441–442. [1 ref.]

Quoting from a recent note, the authors stated that the specificity of parasites, being dependent upon their physiological structure, is altered when the chemistry of this structure is modified by passage through successive hosts. Originally unlimited, except by such factors as body temperature of the host, specificity has become so limited in the course of time that the most specific species must be considered to be the most highly evolved. During this process, the appearance of biological species indicates a stage in the development of new morphological species of very limited specificity.

The case cited, of infestation in a rabbit after the inoculation of scolices from a cyst found in a horse, is claimed to be an example of an intermediate stage which may become a biological species. The authors believe that if this strain of *Echinococcus* continues to occur in horses during successive generations, its power of adaptability will be lowered and its specificity more and more marked. In their present stage of development it is not surprising that certain " horse strains " may still be infective for rabbits.—M. L. BINGHAM.

I. GORDON, H. McL. (1939). **The Occurrence of *Diphyllobothrium latum*, the Broad Fish Tapeworm, in Dogs in Australia.**—*Aust. vet. J.* **15.** 256.

II. GORDON, H. McL. (1940). **The Occurrence of the Broad Fish Tapeworm of Man and Carnivores in Dogs in Australia.**—*Med. J. Aust.* Jan. 13th. 47–48. 1 fig. [4 refs.]

I. This cestode, previously recorded in Australia only in human immigrants, has been recovered from three dogs which have never been away from New South Wales. In one case the dog had eaten fish (species not known) in swampy areas.

II. Similar to I.

CHANDLER, Asa C. (1939). **The Effects of Number and Age of Worms on Development of Primary and Secondary Infections with *Hymenolepis diminuta* in Rats, and an Investigation into the True Nature of " Premunition " in Tapeworm Infections.**—*Amer. J. Hyg.* Sect. D. **29.** 105–114. 5 tables. [13 refs.]

The parasites were found to grow very slowly during the first 5–7 days of infestation ; after this, growth was rapid, the parasite reaching its maximum length in 18 days. After the tenth day the rate of growth was dependent on the number

of worms present. The initial point of attachment in the intestine was 40 cm. or more behind the stomach, but during the 7th–10th days the parasites moved forward to their ultimate anterior position.

Five groups of rats were infected with 1, 5, 10, 20 and 40 cysticercoids per rat respectively; when this infestation was 28 days old each rat was given ten more cysticercoids, and the rats examined ten days later. In all groups a high percentage of primary parasites had established themselves, a 90% establishment being obtained in the group which received 40 cysticercoids. The length of the parasites was in inverse proportion to the number present, ranging from an average of nearly 100 cm. in animals with a single parasite to 30 cm. in animals with 40 parasites.

There was a marked reduction in size, to about half the normal, of secondary parasites even when only one primary parasite was present; the size steadily decreased as the primary infestation increased until, in primary infestations with 20 parasites, the average size of ten-day-old secondary parasites was 2·6 cm. in contrast to 21 cm. of primary parasites of the same age. The power of establishment of secondary parasites was also affected, for when only one primary parasite was present the number of secondary parasites established varied from 1–6, whereas in rats harbouring 40 primary parasites not a single secondary parasite succeeded in establishing itself for longer than ten days.

It was further shown that the presence of 8–10 primary worms, seven days old at the time of reinfestation, restricted the growth of secondary parasites to one-third of the length of the controls, whereas 14-day-old or older primary parasites restricted the length to one-quarter of the normal.

In an attempt to determine whether the inhibition of growth of the secondary worms is due to acquired resistance or merely to overcrowding in the intestine, the primary worms were eliminated by means of carbon tetrachloride. No difference was observed between the rate of growth of secondary worms in these rats and that of worms in previously uninfested rats given carbon tetrachloride, although growth was retarded in both cases. The parasites not eliminated by the anthelmintic increased in size; this increase seemed due to the relief of crowding in the intestine. Maturation, ripening and dehiscence of segments took place at a uniform rate, independent of the rate of growth: growth itself may be retarded by several factors, but there is no corresponding inhibition of the ripening of the segments.

In a final series of experiments the primary parasites were removed mechanically after performing laparotomy; after removal in this way, no effect was observed on the secondary parasites.

C. concludes that "premunition" in cestode infestations is due to crowding of the parasites in the intestine rather than to immunity in the strict sense of the term.—A. L. Wilson.

I. Descazeaux, J., & Capelle. (1939). Contribution à l'étude des champignons prédateurs de larves de nématodes parasites des animaux domestiques. [**Fungi Preying on the Larvae of Parasitic Nematodes**].—*Bull. Acad. vét. Fr.* **12.** 284–288. 1 fig.

II. Deschiens, R. (1939). Conditions de capture des larves de dictyocaules par des hyphomycètes prédateurs. [**Capture of *Dictyocaulus* Larvae by Predatory Hyphomycetes**]. *Bull. Soc. Path. exot.* **32.** 698–700. 4 figs. on 1 plate. [1 ref.]

I & II. These two papers are continuations of work on the action of predatory fungi on nematode larvae [see also *V. B.* **9.** 632 and **10.** 594.]. In the first paper the action of the fungus, *Dactylella brachopaga*, is studied. The fungus immobilized

and digested strongyle larvae from horses and trichostrongyle larvae from cattle in 4–5 days. *Arthrobotrys oligospora* and *D. brachopaga*, however, failed to kill the larvae of *Protostrongylus rufescens* and *Muellerius capillaris* of sheep.

The innocuity of *A. oligospora* and *D. bembicodes* for horses and g. pigs was examined by feeding these animals with moist bran on which the fungi had been cultivated for 15 days. The g. pigs received 100 g. of bran each and the horses one litre of bran each daily for two days. Clinical symptoms were not observed and it is thought that the fungi were destroyed somewhere in the digestive tract since subsequent attempts to cultivate them from the faeces were not successful.

The second paper describes the action of *A. oligospora* and *D. bembicodes* on the larvae of *Dictyocaulus filaria*. Both fungi destroyed all three larval stages, but the action of *D. bembicodes* was quicker than that of *A. oligospora*. A. L. W.

PORTER, D. A. (1940). **Experimental Infections of Swine with the Red Stomach Worm,** *Hyostrongylus rubidus*.—*Proc. helminth. Soc. Wash.* **7.** 20–27. 2 figs., 1 table. [10 refs.]

The infective larvae were obtained by cultivating, on bone charcoal, eggs obtained from the uteri of adult female parasites. The larvae were fed to pigs and eggs appeared in the faeces 20–25 days later, the maximum number of eggs per g. of faeces being recovered between the 23rd and 27th days. In proportion to the number of larvae fed, the maximum number of parasites was recovered on the 24th and 25th days, and the infestation lasted for at least 6–8 months without reinfection. Serious clinical disturbances were not observed in the pigs.—A. L. W.

WEHR, E. E. (1939). **Domestic Fowls as Hosts of the Poultry Gapeworm.** *Poult. Sci.* **18.** 482–486. 5 tables. [4 refs.] [See also *V. B.* **8.** 588].

Valuable information is given on the control of gapeworm infestation in birds. Seven-month-old Pekin ducks and pigeons were found to be unsuitable hosts for *Syngamus trachea*. Thirty-day-old turkeys, young chickens and guinea fowls were shown to be susceptible to experimental infection, which may persist for as long as 224 days in turkeys, 147 days in chickens and 98 days in guinea fowls. It is stated that, in view of their resistance to infection, adult fowls are seldom responsible for the dissemination of the parasite. No symptoms were seen in guinea fowls after experimental infection, but they remained susceptible. After experimental infection of pigeons, it was observed that the lung was infected but not the trachea, and that the larvae had died within the lungs, an indication that there had been a host reaction.—S. G. IYER.

SRIVASTAVA, H. D. (1938). **Studies on the Helminth Parasites of Indian Poultry. Pt. II. The Occurrence of Gapeworms in Fowls.** *Indian J. vet. Sci.* **8.** 239–241. [6 refs.] [Part I not traced].

Four specimens of *Syngamus trachea* were recovered from the trachea of two fowls at Bareilly.

The life-history of the parasite is discussed. In addition to turkeys it is probable that snipe may act as carriers in India.—D. D. OGILVIE.

WEHR, E. E. (1939). **Studies on the Development of the Pigeon Capillarid,** *Capillaria columbae*.—*Tech. Bull. U.S. Dep. Agric.* No. 679. pp. 19. 3 figs., 6 tables. [17 refs.]

All the stages of the parasite are described. Eggs were found to develop to the infective stage in 6–8 days at room temperature; both embryonated and non-embryonated eggs were very resistant to low temperatures, the former being

viable even after 14 days' exposure to temperatures of –6·7° to –12·7°C., while the non-embryonated eggs withstood 35 days' exposure to temperatures of –5·6° to –9·4°C., and completed embryonation when exposed again to room temperature. Drying for 24 hours at room temperature destroyed the viability of partly embryonated eggs. The embryo did not develop within the egg, but development to the second stage larva took place in the second week of infestation and the third stage larva was seen before the 14th day of infestation. Mature parasites were found in the small intestine of experimentally infested birds 19 days after infestation and eggs appeared in the faeces 26 days after infestation; certain of the pigeons were still infested seven months later. All stages of the parasite were seen embedded more or less deeply in the intestinal mucosa, but the larvae were somewhat deeper than the adults. Most of the parasites were recovered from the middle part of the small intestine.—A. L. WILSON.

LANDSBERG, J. W. (1938). **The Blood Platelets in Hookworm Anemia.**—*Amer. J. Hyg.* **27.** 316–320. 2 tables. [15 refs.]

The number of thrombocytes in uninfested dogs was ascertained as a basis for comparison during the experiments. From 214 determinations on 82 animals, a mean of 154,879 per c.mm. of blood, with a standard deviation of 3,307, was established.

Thrombocyte counts, made on young dogs which had been experimentally infected with *Ancylostoma caninum*, showed that there was no significant change in the number of thrombocytes in the peripheral circulation during fatal or non-fatal hookworm infections.

It has been suggested that a hypothetical toxin produced by the worms inhibits the regenerative power of the bone-marrow, thereby producing an aplastic anaemia. According to WINTROBE (1936), however, a feature of the known aplastic anaemias is a reduced thrombocyte count and, therefore, L.'s results are evidence against the theory of toxic inhibition of the haematopoietic function of the bone-marrow.
—A. L. WILSON.

KAUZAL, G. P. (1939). **Method for Obtaining Eggs and Larvae of *Nematodirus* Spp. for Experimental Purposes.**—*J. Coun. sci. industr. Res. Aust.* **12.** 339–341. [2 refs.]

The technique described involves flotation with sugar solution, washing and sedimentation, and occupies four days. During these processes eggs of nematodes other than *Nematodirus* spp. develop, hatch, and the first stage larvae die, leaving a pure culture of *Nematodirus* eggs. [The original should be consulted for details of the method used.]—H. McL. GORDON.

BOZICEVICH, J., & DETRE, L. (1940). **Studies on Trichinosis. VIII. The Antigenic Phase of Trichinosis.**—*Publ. Hlth Rep., Wash.* **55.** 683–692. 3 figs., 2 tables. [11 refs.] [Authors' summary copied *verbatim*].

Antigens have been demonstrated in rabbits as early as 24 hours after the feeding of trichina larvae. The presence and persistence of these antigens in the serum for several days previous to the active development of precipitins has been shown by the injection of their serum into other non-infected rabbits, with the subsequent development of precipitins in the latter. This period of antigen circulation has been referred to as the antigenic phase. The length of the antigenic phase bears a relationship to the speed of production of precipitins in the recipient animals. The total period between the infection of the primary animal and the appearance of precipitins in the recipient animal is relatively contants. The

possible bearing which both quantitative and qualitative factors may have in connection with these results is discussed.

IMMUNITY

WALL, S. (1938). Några ord om diagnoserna vid blodundersökning av nötkreatur på smitta av sjukdomen smittsam kastning hos nötkreatur. [**Serological Diagnosis of Bovine Brucellosis**].—*Svensk VetTidskr.* **43.** 148–152.

In emphasizing the importance of the connexion between the results of agglutination and complement-fixation tests for bovine brucellosis [see *V. B.* **6.** 235 and **8.** 299.], W. proposes the following interpretation scheme and signs :–

Serological Tests.	*Diagnosis.*	*Serological Tests.*	*Diagnosis.*
Aggln. 50 or over	R	Aggln. 5 : c.f.t. +	R
,, 20 : c.f.t. +	R	,, 5 : ,, —	— gs.
,, 20 : ,, —	R	,, 0 : ,, +	R
,, 10 : ,, +	R	,, 0 : ,, —	—
,, 10 : ,, —	—		

R = reactor. — = non-reactor. gs. = recovered from infection.

—J. E.

HAUPT, H. (1940). Untersuchungen über die Agglutination beim seuchenhaften (Bangschen) Verkalben. [**Research on Agglutination in Bovine Brucellosis**]. —*Z. InfektKr. Haustiere.* **56.** 8–24. 4 tables.

H. tested 229 sera using two test suspensions and two methods of setting up the tests. The results are given in detail and discussed at length. He recommends that a suspension which has been killed with phenol (0·5 %) and not heated should be used, that in setting up the tests the test suspension should be added directly to small volumes of whole serum, that the tests should be read after incubation at 37°C. overnight and standing at room temperature for 24 hours, and that they should be read without shaking since subjective errors in reading are thereby avoided. One of the two test suspensions, *i.e.* the one prepared without heating gave clearer results than the other which was heated. In a considerable proportion of cases the reading taken immediately after overnight incubation was one or more tubes lower than that taken after a further 24 hours at room temperature.

The differences in titre found in the two set-ups were considerable, sometimes as much as four and often two tubes, and occurred in both directions.

The results as regards the method of preparing the test suspension would seem to apply only to the actual suspensions used because as H. states, neither the strains nor the thickness of test suspension were the same, and only one suspension of each kind was used.—A. W. STABLEFORTH.

FLEISCHHAUER, G. (1939). Ueber eine weitere Methode zur Untersuchung von Blutseren auf Abortus Bang. [**A Method for Testing Blood Sera for** ***Brucella abortus***].—*Berl. Münch. tierärztl. Wschr.* June 23rd. 399–400. [5 refs.]

Sera from 653 g. pigs and 212 cattle were examined by the drop method described by FLEISCHHAUER and CANIĈ [*V. B.* **10.** 599]. When compared with

the normal agglutination reaction it only disagreed in 0·7% of the g. pigs and 1·9% of the cattle.—P. S. WATTS.

RÖEPKE, M. H., & FITCH, C. P. (1940). **The Preparation of *Brucella abortus* Plate Antigen and Some Factors Affecting the Sensitivity of the Antigen.**—*J. infect. Dis.* **66.** 17–22. 3 tables. [12 refs.]

Studies on the factors which may affect the sensitivity of plate antigens have usually been qualitative in nature and in the data now recorded an attempt is made to present the effects of these factors quantitatively. The antigens examined are compared with regard to the details of preparation, presence of phenol and soluble agar, percentage of bacterial cells present and relative sensitivity compared with standard antigen. If 0·5% phenol solution is used to suspend the bacteria the major portion of the phenol is absorbed by the medium. The soluble agar concentrations in the supernatant fluid varied from 0·28–0·54%, depending on the amount of phenol-saline used to suspend the bacteria and the time of contact with the medium. Marked variations in the relative sensitivities of the antigens were noted. Antigens prepared by washing the cultures with large amounts of saline and then centrifuging to remove the substances absorbed from the medium, resulted in antigens with much more uniform sensitivities.—S. J. GILBERT.

DUNCAN, J. T. (1938). **The Specific Character of the Stage of Aggregation in Agglutination and Precipitation of Antibody-Antigen Compounds.**—*Brit. J. exp. Path.* **19.** 328–338. 4 tables. [9 refs.]

There are two theories concerning the aggregation of particles as observed in agglutination reactions. The earlier one postulates a two-phase phenomenon in which the first phase corresponds to the specific combination of agglutinin with bacteria whereby the bacteria or antigenic particles become coated with specifically adsorbed antibody ; the particle then reacts in a physical and non-specific manner and flocculation occurs in the presence of an electrolyte. A more recent hypothesis, supported by work on immune serum precipitation of polysaccharide, azoprotein and crystalline protein antigens, is that a continuous physico-chemical reaction occurs in which the aggregates are built up of molecules of antigen and antibody specifically linked together to form a " lattice " structure, analogous to the formation of crystals.

In a mixture of two or more antigenically heterogeneous reacting systems it should be possible to observe whether the earlier or the latter theory is correct. The experimental work described involved immune serum agglutination of flagellated and non-flagellated bacteria, precipitation of yeast extract and crystalline protein antigens and the non-specific agglutination of bacteria by dialysed, salt-free serum.

The work on immune serum agglutination of bacteria shows that in a mixture of two or three antigenically heterogeneous agglutinating systems, the velocity of agglutination is that of individual systems and gives support to the view that agglutination by immune serum is specific in all its stages, as demanded by the " lattice " hypothesis. The results of the precipitation tests pointed to a non-specific aggregation possibly super-added to a primary specific one. The occurrence of a non-specific effect in the precipitation reaction may perhaps be explained by the great preponderance of antibody compared with the small amount necessary to agglutinate bacteria. It is pointed out, however, that its incidence appears to be secondary to a specific combination and not inconsistent with the " lattice " hypothesis.—R. LOVELL.

SCHAEFER, W. (1940). Sur la séparation des anticorps lipoïdiques polysaccharidiques et protéidiques des sérums tuberculeux au moyen de la réaction de l'inhibition spécifique. [**Separation of Lipoid, Polysaccharide and Protein Antibodies of Tuberculous Serum by the Specific Inhibition Reaction**].—*Ann. Inst. Pasteur.* **64.** 301–315. 8 tables. [14 refs.]

By using different methods of chemical treatment and extraction of tubercle bacilli, S. prepared antigens which were entirely lipoid, polysaccharide or protein in nature. These antigens had their corresponding antibodies in sera prepared against the whole bacilli. The antibodies to the different chemical antigens could be selectively adsorbed from the sera by the mixture of the serum and antigen in optimal proportions until the serum contained only antibodies to a single chemical antigen.

The methods and technique of preparing the pure antigens and the inhibition of the antibodies are described in detail.—D. L. HUGHES.

DISEASES, GENERAL

CARLSTRÖM, B., & ALEGREN, A. (1940). Om alveolärt lungemfysem hos häst. [**Broken Wind in Horses**].—*Beretn. 5. nord. Vet.-møde. Kbh., 1939.* pp. 894–910. 5 figs. Discussion pp. 910–914. [English summary]. [English version appeared in *Skand. VetTidskr.* **30.** 10–25. (1940)].

In the authors' experience broken wind is most common in heavy horses confined in cold and badly ventilated stables. They have done much work on the allergic theory of causation, but their results have failed to support it. They believe that the exciting cause is an irritant in the inspired air, which causes a physiological or inflammatory stimulation of the epithelium of the terminal bronchioles, resulting in the excretion of mucus which blocks the alveolar ducts, thus imprisoning air in the alveoli. The alveoli are held in a state of dilatation by the air and the result is that the muscular and elastic parts of the wall become fatigued and eventually atrophied. All stages between acute reversible and chronic irreversible emphysema may exist, according to the severity of the irritation.

To differentiate between curable and incurable broken wind the authors give a subcutaneous injection of 4 cg. atropin, the action of which is to relax the bronchial muscles and to inhibit the secretion of mucus. In curable cases the symptoms of broken wind (abnormal form of respiration, backward displacement of the caudal border of the lungs and the characteristic respiratory sounds) all disappear, but in incurable cases they remain. Another test consists of exercising the horse briskly for 30 minutes while noting the pulse and breathing rates every five minutes. In normal horses both rates rise steadily and in a parallel manner, in horses with chronic broken wind the pulse rate rises very steeply but the respiration rate remains slow, whilst in acute broken wind, the latter at first remains slow and rises later, the pulse rate rising steeply without delay. These effects are best appreciated by the use of a graph to record the data.

Acute broken wind may be cured by the removal of the irritant and by a course of atropin injections, 2–3 cg. twice daily, for as long as necessary. Belladonna given *per os* is useless.—J. E.

HAUGE, K. (1940). Ondartet katarrfebers etiologi. [**The Cause of Bovine Malignant Catarrh**].—*Norsk VetTidsskr.* **52.** 99–110. 1 table.

A discussion of the literature and an account of the disease in Norway. Between 1926 and 1936 there were 4,104 cases of B.M.C. in Norway, 2,697 cases

being fatal A table shows the number of cases reported in the several provinces during this ten-year period, the numbers of cattle and sheep, the percentage of cases in the cattle population and the proportion in cattle to sheep. No close connexion between B.M.C. and the density of sheep could be demonstrated, nor between the disease and severe weather or unfavourable dietary conditions of winter.—J. E.

I. HOFLUND, S. (1939). Rubbningar i digestionsarbetet som följd av skador å n. vagus. [**Digestive Disorder in Cattle due to Injury to the Vagus Nerve**]. —*Svensk VetTidskr.* **44.** 11–21. 1 fig. [7 refs.]

II. HOFLUND, S. (1940). Kroniska digestionsrubbningar hos idisslare som följd av skador å n. vagus. [**Chronic Digestive Disturbances in Ruminants Consequent on Injuries to the Vagus Nerve**].—*Beretn. 5. nord. Vet.-møde, Kbh., 1939.* pp. 915–936. 1 fig. [12 refs.] [English summary].

I. A preliminary précis of II.

II. This is a supplement to an earlier article [*V. B.* **6.** 162.] and contains an account of research on experimental cattle, sheep and goats carried out to elucidate the cause of the digestive disturbance referred to therein.

The abdominal vagus nerves or their branches were divided at various levels and the effects on the four stomachs were observed *ante* and *post mortem*. In general, loss of vagus nerve supply paralysed the viscus concerned resulting in stagnation of ingesta and tympany, which might lead to death from inhalation of stomach contents or from inanition.

Digestive disorders which may be due to dysfunction of the vagus nerve occur in cattle in connexion with neoplastic or inflammatory swellings of the peritoneum (traumatic peritonitis in the region of the reticulum), of the mediastinum and of the pleura.—J. E.

BENNETTS, H. W., & HALL, H. T. B. (1939). **The Investigation of "Falling Disease" of Cattle in the South-West.**—*J. Dep. Agric. W. Aust.* **16.** 156–160.

This is a disease with an extremely acute course, affecting mainly dairy cows in a limited area of the south-west coastal belt in Western Australia. The incidence is definitely seasonal, mainly occurring between July and December, and the mortality rate ranges from 5–40%. *Ante-mortem* indications of illness are rarely seen. An animal in apparently normal health will suddenly fall to the ground, death usually occurring within periods varying from a few seconds to five minutes.

Macroscopic lesions are not very characteristic, but the spleen and, to a lesser extent, the liver and kidneys characteristically show extensive haemosiderosis on microscopic examination. An outstanding feature of the disease is marked anaemia and this occurs in many apparently healthy animals during the "falling disease" season; natural recovery from the anaemia begins about the same time as losses from the disease cease.

It has not been possible to reproduce the disease in experimental conditions, but there is much evidence to suggest that stock in affected areas may suffer from a deficiency of copper and/or other minerals. No definite recommendations can be made, but a limonite lick is tentatively suggested to be of some indirect value. —H. B. CARTER.

OLSON, T. M. (1940). **Bloat in Dairy Cattle.**—*J. Dairy Sci.* **23.** 343–353. 1 table. [Numerous refs.]

After reviewing the literature on tympanites and quoting a summary of the

suggested causes, O. discusses the literature on the chemical composition of gases obtained from normal and bloated animals and laboratory-fermented vegetable foods. Analyses show that gas from bloated animals contains approximately 17% of methane whereas the same materials fermented *in vitro* produce little or no methane. It is suggested that the rapid formation and absorption of gases when legumes are eaten are due to a series of factors none of which will cause bloat or death in themselves. It is known that carbon monoxide and hydrogen sulphide are highly toxic gases; they are produced under normal feeding conditions and yet are not fatal. The other gases present in the rumen are negative in their effect on animals, yet these gases may be responsible for inducing the condition which makes the toxic gases fatal by increasing the intra-ruminal pressure or inhibiting the normal functions of the rumen.—R. FISHER.

McNUTT, S. H., & WALSH, F. E. (1939). **Venereal Infections of Cattle. Their Manner of Spread and their Eradication.**—*Vet. Med.* **34.** 468–473. 1 fig. [6 refs.]

This discussion deals with the non-specific venereal infections, considered in a previous paper [*V. B.* **4.** 34]. These conditions are increasing in mid-west U.S.A., and the reason for this lies in the misapplication of a breeding scheme, which has provided for the eradication of Bang's disease only, so that proved sires were used and high pedigree females were purchased, regardless of their state of health in other respects.

Control measures advocated for these venereal diseases include temporary cessation of all breeding until a full history of breeding and management of the herd is obtained. Next, all diseased cows are separated from the healthy stock. Since bulls used in an infected herd are almost always diseased they should be sold for slaughter, and replaced by young, unused bulls which are therefore presumed to be uninfected. Valuable cows may be treated, and mated after an examination to ascertain whether signs of disease persist.—M. L. BINGHAM.

THOMAS, J. F. H. (1937). **Causes of Loss in Sheep.**—*J. Bath. W.S. Co. Ass.* **11.** 34–42.

A review is given of the incidence of losses caused by death, and by circumstances which induce a falling off in the rate of thriving or increases in the amount of time and labour expended in attendance on sheep.

Several individual causes of loss such as pregnancy toxaemia, lambing sickness and deaths in ewes during and following parturition are considered. The chief causes of lamb mortality dealt with are :– deaths from exposure and starvation, navel or joint ill, lamb dysentery, lockjaw, pulpy kidney disease and worm infestation.

Certain other disorders, *viz*, liver fluke infestation, various forms of foot-rot, contagious pustular dermatitis and enterotoxaemia which affect sheep of all ages are briefly discussed, and the problem of blowfly control is mentioned.—R. A.

GREGORY, T. S. (1939). **Foot-rot in Sheep : A Progress Report on Field Trials.** —*J. Coun. sci. industr. Res. Aust.* **12.** 330–338. [1 ref.]

G. reviews recent investigations on foot-rot. His observations confirm BEVERIDGE's contentions [*V. B.* **9.** 331.] that (a) the essential cause of foot-rot is a bacterium which has been temporarily designated organism " K ", (b) this organism occurs only in diseased sheep's feet and (c) its survival time apart from diseased sheep's feet is short. G. reports several field trials designed to determine

whether foot-rot could be controlled by eradication measures and to obtain further information on the maximum survival time of the causal organism on pastures.

One trial concerned a flock held on highly improved irrigated pasture for nearly two years. These sheep remained entirely free, although sheep on this pasture had been severely affected prior to the adoption of control measures and although the disease continued on other sections of the property. Similarly in another trial, some sheep free of foot-rot were isolated in one paddock and these remained healthy while outbreaks occurred in control sheep in surrounding paddocks. Four properties, each running from twelve to thirty thousand sheep, put into practice the methods BEVERIDGE had suggested for the control of foot-rot by eradication; all remained free of the disease during the ensuing season under conditions considered conducive to foot-rot. Other trials indicated that even wet pasture heavily contaminated lost its infectivity after five days.—W. I. B. B.

STEWART, W. Lyle, & PONSFORD, A. Phyllis. (1940). **Northumbrian Pining not Curable by Cobalt Administration.** *Vet. Rec.* **52.** 379–382. 3 tables. [13 refs.]

Details are given of an experiment, conducted on a Northumbrian hillside farm with five groups of sheep, for a study of the incidence and prevention of "pining". After $2\frac{1}{2}$ years' continuous treatment it was found that anthelmintic treatment with $CuSO_4$ and nicotine, supplementary feeding with a heavily mineralized cake or a combination of these treatments were all effective in considerably reducing the incidence of "pine" compared with untreated controls. Half of the sheep comprising the two control groups were dosed daily with 3 mg. Co (as the chloride) for five months. The treated sheep appeared to increase slightly in weight compared with untreated animals, but these differences were not significant nor was there any difference in haematocrite values between dosed and undosed sheep after five months. The authors disagree entirely with the conclusion reached by CORNER and SMITH [*V. B.* **9.** 882.] that Co therapy is specific in prevention and cure of "pine".—ALFRED EDEN.

MOUTAUX. (1940). Particularités observées sur les thyroïdes de mouton. **[Peculiarities of the Sheep Thyroid].**—*Rec. méd. vét.* **116.** 17.

The appearance of the thyroid gland was particularly interesting in two ewes, one affected with tetany and the other with milk fever. In the centre of each lobe was a cavity, the size of a date stone, without any surrounding inflammation. This cavity contained a homogeneous, straw-coloured, viscous, creamy paste, not pus nor colloid substance, composed of epithelial cells in various stages of degeneration. There were no other visible lesions in the thyroid tissue beyond slight pigmentary infiltration.—ALFRED EDEN.

MENZIES-KITCHIN, A. W. (1937). **Fertility, Mortality, and Growth Rate in Pigs.** —*J. agric. Sci.* **27.** 611–625. 12 tables, 3 graphs. [13 refs.]

This paper comprises an analysis and a cautious interpretation of data collected for the East Anglian Pig Recording Scheme during 1927–1931. Breed differences were found to include a greater prolificacy in Large White than in Large Black sows, but a correspondingly lower pre-weaning mortality in Large Black progeny. In piglets of all breeds under investigation, there was a slackening of growth or even a decline in weight between the third and fourth weeks of age. The fallacy of attempting to rear very large litters is exposed by the increasingly high death-rate in litters of 13 and over. At six weeks of age, individual weights were lowest in litters with the largest number of survivors; this finding is not in agreement

with the records of a similar investigation carried out in New Zealand, and it is suggested that the utilization of dairy by-products for pig-feeding may be responsible for the more favourable result in that country. Post-weaning mortality was highest in litters showing the greatest variation in weight, and the value of producing evenly-balanced litters is further shown by the much greater time taken for the lighter pigs of a litter to reach bacon weight.

Gilt litters were both smaller and lighter than those of mature sows, but their mortality-rate, possibly on account of smaller losses from crushing, was lower.
—ALASTAIR N. WORDEN.

—. (1940). **Discussion on Nervous Affections in Man and Animals.** [FINDLAY, G. M., & INNES, J. R. M.] *Proc. R. Soc. Med.* **33.** 161–172. [Num. refs.]

The discussion was opened by F. who first mentioned the differences in reaction of the central nervous system of man and animals to injury; the human central nervous system is more susceptible to trypanosomes, bacteria and spirochaetes, whereas both animals and man are equally susceptible to a number of spontaneous virus infections. He then gave a list of virus diseases according to whether they affected man, animals or both. The greater part of the paper deals with demyelinating diseases in animals and man, including a large variety of conditions affecting domestic animals and wild animals in captivity. A brief reference is made to psychopathological conditions in animals, such as canine hysteria.

The second half of the discussion was contributed by I. who dealt with a variety of conditions affecting the central nervous system of animals—malformations, pigmentation, atrophy, ossifying spinal meningitis and intracranial tumours. Canine encephalitis is dealt with at some length and original work is described from which it is concluded that a variety of types may occur, including disseminated encephalomyelitis with demyelination and diffuse cortical vascular proliferation without inflammatory changes. Attempts to isolate distemper virus from such cases failed, and attempts to transmit the encephalitis to other dogs were also unsuccessful. In addition, no inclusion bodies of the type stated to be characteristic of canine distemper were found in the cases of encephalitis examined. It is suggested that the condition may be related to a virus infection.—E. G. WHITE.

ASSÈMAT, A. (1939). Maladies à poussières et industries à poussières. [**Dust-Borne Occupational Diseases**].—*Thesis méd., Paris.* pp. 78. [Num. refs.]

Mainly of human medical interest. A. deals with the inhalation of mineral dusts and the lesions in the respiratory tract arising therefrom. These dusts, independently of their specific action, constitute an aggravating factor in pulmonary diseases, particularly in the case of silicosis and tuberculosis. There is a useful bibliography of works on this subject.—N. J. SCORGIE.

HOFFMAN, H. A. (1939). **Vesicular Dermatitis in Chickens.**—*J. Amer. vet. med. Ass.* **95.** 329–332. 5 figs. [5 refs.]

H. records an outbreak of this disease in chickens; it involved the unfeathered portions of the body, and, occasionally, there was arthritis. A non-pigment-producing staphylococcus was always present in the lesions. Attempts were made to produce the disease both by inoculation of exudate from the lesions, and by inoculation of the staphylococcus, on to the scarified skin of healthy birds. It is possible, but not certain, that a mild form of the disease was reproduced. Attempts to transmit the disease by other methods failed. Recurrence of the lesions occurred in some instances after apparent recovery. Some similarity was recorded between

the staphylococcus from this outbreak and a strain isolated from a case of impetigo in man. [Further study seems necessary to establish the nature of the condition].
—S. G. IYER.

HÖGE, W. (1937). Beiträge zur Frage der Uebertragbarkeit der Rinderleukose. **[Transmissibility of Bovine Leucosis].**—*Inaug. Diss., Berlin.* pp. 38. 9 tables, 10 charts. [Numerous refs.]

Using groups of from 1–3 animals, H. observed that injection of normal serum slightly increased the number of red cells, without raising the temperature. When material from normal lymph nodes was injected intramuscularly, a slight, neutrophile leucocytosis and an increase in r.b.c. occurred, but there was no rise in temperature. Some 5–10 days after an intravenous injection of material from leucotic lymph nodes, however, the temperature rose, the r.b.c. decreased and lymphoid cells and Rieder's lymphocytes were observed in the blood. Splenectomized animals had a greater reaction, but " blocking " of the reticulo-endothelial system by means of a ferric saccharate solution had no effect, and neither had a second injection of the lymph node material, nor implantation of the material into the anterior chamber of the eye, nor subcutaneous injection. Elityran and insulin injections did not affect the clinical course of the disease. Details of the blood cell counts for each animal are given in tables. [Much of this disagrees with the work of DOBBERSTEIN and PIENING (*V. B.* **4.** 767)].—P. S. WATTS.

KABAT, E. A., & FURTH, J. (1940). **Chemical and Immunological Studies on the Agent Producing Leukosis and Sarcoma of Fowls.**—*J. exp. Med.* **71.** 55–70. 9 tables. [16 refs.]

The extract of sarcoma lesion is as a rule viscous due to a polysaccharide, and, by treatment with an enzyme, the viscosity of the extract can be reduced without affecting its activity. By one-third saturation with sodium sulphate most of the active agent from the tumour extract was precipitated and this method can, with some advantage, be combined with high speed centrifugation. Comparisons were made on the crude tumour extracts and purified suspensions prepared from them, by determining their nitrogen content and testing their stability by test inoculation of chicks. The authors found that the activity of the tumour-producing agent was the same in the material sedimented by high speed centrifugation as in the original crude extracts. The active agent contained in the tumour extract could not be differentiated by immunity tests from a similar, if not identical, fraction prepared from certain normal tissues. That these two fractions are chemically related was suggested by CLAUDE, but the evidence available from this study does not warrant a definite conclusion. Further, the authors consider that the mere presence of large amounts of sedimentable material in the tumour is no indication of its relation to the " virus " ; tissues free from such virus were found to contain much more of this heavy substance than the most active tumour preparations.

The total amount of the sedimentable fraction obtained after high speed centrifugation was less in normal sera than in leucotic serum or plasma. It was shown that the virus of leucosis was firmly associated with the blood cells.

In experimental leucaemia the average nitrogen content of the serum per 10 c.c. was 0·633 mg. in the case of one strain, and 0·476 mg. for another strain as compared with an average of 0·34 mg. for normal sera. Serological tests by precipitation or complement fixation failed to disclose any specific antibody in the immune sera prepared from the known extract or the leucotic serum using high speed deposits.—S. G. IYER.

FURTH, O. B., BARNES, W. A., & BROWER, A. B. (1940). **Studies on Resistance to Transmissible Leukemia in Mice by means of Parabiosis.**—*Arch. Path.* **29.** 163–174. 2 figs., 7 tables. [Numerous refs.] [Authors' summary copied *verbatim*].

Parabiosis [experimental junction of two individuals] has been used as a means of studying the factors of resistance and susceptibility to transmissible leukemia in mice.

Leukemic cells pass from one susceptible parabiont to the other and produce leukemia in both.

The development of leukemia in a susceptible mouse inoculated with leukemic cells is not influenced by its parabiotic union with a resistant mouse.

Leukemic cells injected intravenously into a resistant mouse may pass to a susceptible parabiont, producing leukemia in the latter without ill effect on the former.

Resistance to transmissible leukemia in mice of a stock only partially resistant to leukemia remains likewise unaltered by parabiosis with susceptible mice.

The presence of blood vascular anastomosis between parabionts has been demonstrated by the passage of erythrocytes from one parabiont to the other.

CHOWN, B., LEE, M., TEAL, J., & CURRIE, R. (1939). **On the Experimental Production of Nephritis in Rats by Means of Parathyroid Hormone and of Vitamin D.**—*J. Path. Bact.* **49.** 273–290. 17 figs. on 4 plates, 1 table, 2 charts. [Numerous refs.]

Large doses of parathyroid extract, of the order of 10 U.S.P. (vol. XI) units upwards, were given at varying intervals to young rats of three different laboratory strains. A chronic nephritis usually supervened, and was characterized by primary lesions in the tubules or interstitial tissue; it was often of great severity. The commonest primary lesion was a simple deposition of calcium within the lumen of the tubule and in the adjacent interstitial tissue, but a primary necrosis of the tubular wall, with or without associated calcium deposition, was sometimes encountered. Polycystic kidneys caused by a cystic dilatation of the tubules were also found in many cases. Untreated rats of the same strains, maintained up to two years under comparable conditions, often showed a mild albuminuria and an occasional renal lesion, but there was no evidence of an idiopathic or other chronic nephritis.

Vitamin D in daily doses of 1,500 I.U. upwards, with periods of rest, was found to cause an early calcium deposition within the tubules; when administered over long periods it occasionally led to a chronic nephritis. Renal deposition of calcium in the vitamin D group was increased when 0·1 mg. Ca per g. body weight was added to the diet in the form of calcium lactate.—ALASTAIR N. WORDEN.

SCHLOTTHAUER, C. F., MCDONALD, J. R., & BOLLMAN, J. L. (1938). **Testicular Tumors in Dogs.**—*J. Urol.* **40.** 539–550. 9 figs., 1 table. [14 refs.] [Abst. in *Amer. J. Cancer.* **38.** 426, copied *verbatim*].

This report is based upon a study of 82 spontaneous testicular tumors occurring in 48 dogs. The predominating growths were interstitial-cell tumors, which numbered 51, and seminomas, numbering 25. Of the remaining 6 tumors, 4 were grade 1 adenocarcinomas, associated in each instance with an interstitial-cell tumor and in 3 instances with seminomas as well; 1 was a grade 2 and 1 a grade 4 adenocarcinoma.

The interstitial-cell tumors, the authors state, undoubtedly originate from the interstitial cells of the testis. The seminomas arise in the seminiferous tubules

and 18 of the 25 in this series showed unmistakable evidence of multiple foci of origin. Fourteen of the seminomas were wholly "*in situ*", that is, they had not broken through the basement membrane of the seminiferous tubules. In these cases it was possible to trace the malignant cells directly from the spermatogenic series—probably the spermatocytes. Because of their origin in the seminiferous tubules, the seminomas are actually adenocarcinomas. All those in the present series were of grade 4 malignancy.

Nine photomicrographs are included and references are appended.

MARTIN, J. F., BALL, V., DECHAUME, J., & COLLET, P. (1939). Schwannome cutané à type paciniforme chez le chien. [**Cutaneous Schwannoma of Pacinian Type in a Dog**].—*Bull. Ass. franç. Cancer.* **28.** 689–692. 1 fig. [Abst. in *Amer. J. Cancer.* **38.** 289, copied *verbatim.* Signed: L. FOULDS].

Rounded bodies, having the appearance of Pacinian bodies, were present in the midst of schwannoma tissue of the usual structure. The smaller bodies consisted of five or six lamellae of flattened cells and a central space occupied by a cytoplasm or syncytium containing one or several nuclei; the larger bodies had up to twenty lamellae. The tumor also contained areas of cholesteatoma.

The source of the material is not mentioned. One photomicrograph is included.

JACOBSON, S. A. (1940). **Contribution to the Pathogenesis of Multiple Hereditary Osteochondromatosis. An Experimental Study.**—*Amer. J. Cancer.* **39.** 220–223. 4 figs. [2 refs.] [Author's summary copied *verbatim*].

Experimental evidence is presented to demonstrate that wherever cartilage and bone, however formed, are growing together, a mutual polarity may result. By virtue of this an epiphysis-like structure is produced. This, if true, would adequately explain the epiphysis-like architecture of cartilaginous exostoses.

BITTNER, J. J. (1940). **Possible Method of Transmission of Susceptibility to Breast Cancer in Mice.**—*Amer. J. Cancer.* **39.** 104–114. 7 figs., 5 tables. [Numerous refs.] [Author's summary copied *verbatim*].

(1) The development of breast carcinoma in high-cancer strains of mice is probably due to three influences: (*a*) "breast-cancer-producing influence" transmitted in the milk of breast-cancer stock mothers; (*b*) an inherited breast cancer susceptibility of one or more dominant factors; (*c*) a hormonal stimulation influence.

(2) The breast tumor incidence of a high-tumor stock may be reduced by fostering one generation of young to low-tumor stock females.

(3) No significant increase in the breast tumor ratio was observed from fostering low-cancer stock young to high-cancer females.

(4) The incidence of breast tumors in first generation hybrid mice which inherit the breast cancer susceptibility and have the hormonal stimulation may be increased or decreased as the result of nursing.

(5) Breast tumors which are not transmitted may result from other causes.

WHITE, J., & WHITE, F. R. (1939). **On the Nature of the Glutamic Acid of Malignant Tumor Tissue. [Correspondence].**—*J. biol. Chem.* **130.** 435–436. 1 table. [4 refs.] [Abst. in *Amer. J. Cancer.* **38.** 423, copied *verbatim.* Signed: A. F. WATSON].

The ultimate solution of the cancer problem will probably involve the recognition of specific chemical differences between the development of normal

and neoplastic tissues. While so far little real progress has been made in this field, much work has been done to establish some essential difference between the two types of tissue. Recently for instance, Kögl and Erxleben have claimed that a considerable proportion of the glutamic acid obtained from the hydrolysates of malignant tissue, unlike that from normal tissue, consists of the d(–) form. This claim has aroused interest in English and American laboratories. Chibnall and his colleagues in London have been unable to substantiate the findings of the Dutch workers. Graff of Columbia University now supports the London claims that l(+) glutamic acid only can be isolated from malignant tumors and that no racemic glutamic acid is present. He examined for this purpose the Walker rat sarcoma No. 256, the Crocker rat sarcoma No. 8, the Crocker mouse sarcoma No. 180, the Flexner-Jobling rat carcinoma, the Rous sarcoma, and two human carcinomas.

Since their results have been challenged Kögl and Erxleben have pointed out that Chibnall and his colleagues failed to adhere closely to their experimental methods, which involved the butyl alcohol extraction of the tumor hydrolysate followed by the isolation of glutamic acid as the hydrochloride from the aqueous solution containing the butyl alcohol-insoluble amino acids.

In the second communication White and White of New Haven submit data which seem to clear up the discrepancy between the results of the Dutch and London workers. They have closely followed the Kögl and Erxleben technic and have succeeded in preparing a glutamic acid preparation which contains a significant proportion of the non-natural isomer. On the other hand by following the method of Chibnall and his associates (barium or calcium salt procedure of Foreman), the Whites have obtained similar results to the London workers.

Green, R. G., Goodlow, R. J., Evans, C. A., Peyton, W. T., & Titrud, L. A. (1940). **Transmission of a Human Papilloma to Monkeys.**—*Amer. J. Cancer.* **39.** 161–171. 11 figs. [6 refs.] [Authors' summary copied *verbatim*].

1. Inoculation of the eyes of three monkeys with a saline suspension of a finely ground, cutaneous papilloma from a human patient resulted, in all three cases, in the proliferation of conjunctival epithelium to form small tumors at the inoculation site.

2. The tumors developed simultaneously after an incubation period of about thirty days, and attained maximum growth within the following thirty days.

3. The formation of the tumors by proliferation of the conjunctival epithelium of the experimental animals is highly suggestive of the presence of an infectious agent, perhaps a virus, in the human papilloma.

NUTRITION IN RELATION TO DISEASE

Wunsch, D. S. (1939). **Trace Elements in Livestock Diseases.**—*Chem. Ind. Rev.* **58.** 531–533. [7 refs.]

A brief description of Australasian work on Co since 1937, including a discussion of Co-containing supplements and fertilizers. Where trace element deficiency is suspected in connexion with any particular disease, W. advocates empirical drenching of the animal with groups of known elements in attempts to incriminate the one concerned, and suggests that this method would have considerably shortened the time required to solve the " bush sickness " problem in New Zealand.—Alfred Eden.

WINTROBE, M. M. (1939). **Nutritive Requirements of Young Pigs.**—*Amer. J. Physiol.* **126.** 375–387. 5 figs., 3 tables. [Numerous refs.] [Abst. in *Nutr. Abstr. Rev.* **9.** 326, copied *verbatim.* Signed: A. N. WORDEN].

Piglets from 8 pure and 5 crossbred litters were removed from their sows at ages varying from 2 to 23 days, and were reared successfully on a synthetic diet in laboratory conditions. The most successful basal diet was one of casein 9·5, lard 4, cod liver oil 0·5, sucrose 21, and a salt mixture based on the mineral content of sow's milk with additional iodine and iron 2·2 parts. When supplemented with 3 g. yeast daily per kg. bodyweight, this diet promoted weight increase equal to that attained on experimental farms. Onset of diarrhoea after weaning occurred, however, in almost every case.

When the adequate salt mixture was replaced by 0·03 g. of an inadequate one (Cowgill, *J. Biol. Chem.*, 1923, **56.** 734) and 0·15 g. ferric ammonium citrate per 100 g. solid food, growth was impaired or arrested, spontaneous fractures occurred, osteoporosis was marked, the teeth became pitted and chipped, and death ensued in 10 to 11 weeks.

Complete withdrawal of the yeast supplement resulted in an acute illness characterised by prostration and convulsions. In cases in which the yeast was gradually reduced below 1 g. per kg. bodyweight, the symptoms were more chronic, and included loss of weight, dirty coats, diarrhoea and, in some instances, vomiting, impaired gait, and eventually ataxia. Sensory nerve degeneration and anaemia were also present. Some improvement followed the intramuscular injection of riboflavin in amounts equivalent to 60 γ per kg. bodyweight daily, but it did not compare with that resulting from therapy with vitamin B_1 or nicotinic acid. No improvement resulted from the administration of yellow maize meal as a source of vitamin B_6. Commercial liver extract and a milk vitamin preparation, labco, showed no advantages over yeast as a source of growth factors.

Eight piglets, which were weaned at from 8 to 24 days of age and reared on cow's milk, showed growth rates equal to those receiving the above mentioned basal diet with yeast.

WINTROBE, M. M., SAMTER, M., & LISCO, H. (1939). **Morphologic Changes in the Blood of Pigs Associated with Deficiency of Water-Soluble Vitamins and Other Substances Contained in Yeast.**—*Johns Hopk. Hosp. Bull.* **64.** 399–422. 2 text figs., 7 figs. on 1 plate, 1 table. [Numerous refs.]

This paper deals with the anaemia which occurred in young pigs reared on a synthetic diet and subsequently deprived of yeast. Observations upon the growth and upon the degenerative nervous lesions of the same animals have been recorded elsewhere [see above, and *V. B.* **9.** 269]. The blood picture remained essentially unchanged in control animals which received 3 g. or more of yeast per kg. bodyweight daily. When less than this amount of yeast was added to the basal vitamin B deficient diet, there developed an anaemia characterized by polychromatophilia and by the appearance of macrocytes, Howell-Joly bodies, nucleated R.B.C.'s and somewhat increased numbers of reticulocytes. Aneurin, riboflavin and nicotinic acid did not replace the yeast, and in a single case the injection of a concentrated liver extract into an anaemic pig was without effect.—ALASTAIR N. WORDEN.

I. KRUPSKI, A., ALMASY, F., & UEHLINGER, E. (1938). Untersuchungen über den Kalzium-Phosphorstoffwechsel beim Kalb. [**The Metabolism of Calcium and Phosphorus in Calves**].—*Schweiz. landw. Mh.* **16.** 178–195. 6 figs., 4 plates, 3 tables, 3 diagrams. [14 refs.]

II. KRUPSKI, A., ALMASY, F., & UEHLINGER, E. (1938). Weitere Untersuchungen über den Calcium-Phosphorstoffwechsel von Tieren der Braunviehrasse. **[Calcium-Phosphorus Metabolism of Swiss Brown Cattle].**—*Schweiz. landw. Mh.* **16.** [Abst. from reprint, pp. 21].

I. Two fortnight-old calves were fed on whole milk gradually supplemented with increasing quantities of hay, the total allowance during 112 days being 586 litres. One received vitamin D_1, the other not. Balance experiments showed good retention of Ca and P in both cases in the early stages of high milk consumption, but much superior retention in the vitamin fed calf as feeding passed over exclusively to hay. Biochemical and histological data are included.

II. Malformation of limbs, particularly of the fore-legs, developing soon after birth, is described in three calves, and characterized in balance experiments by defective retention of calcium and phosphorus, both in regard to quantity and ratio. The clinical and histological picture was not that of rickets, and aetiology is obscure. The condition was not influenced by vitamin D alone but one calf showed improved retention of Ca and P under combined treatment with vitamins A, C, and D.—H. H. GREEN.

SCHOUR, I. (1938). **Calcium Metabolism and Teeth.**—*J. Amer. med. Ass.* **110.** 870–877. 4 figs. [Numerous refs.]

A brief review is given of the normal metabolism of Ca, and the process of calcification of teeth. The influence on calcification of the endocrine organs and of the vitamins is discussed, and evidence of the relationship between mottled teeth and high fluorine intake is presented. It is pointed out that the adult and fully erupted tooth is not subject to modification in structure or calcification by changes in Ca metabolism. The Ca content of dentin may be slightly increased with age by secondary calcification, but, unlike bone, enamel and dentin are not storehouses of Ca and are not subject to withdrawal. The employment of Ca therapy in dentistry *per se* is deprecated.—R. ALLCROFT.

DOLS, M. J. L. (1939). **Phosphorus Metabolism in Normal and Rachitic Chickens with a Radioactive Phosphorus Isotope as an Indicator.**—*Proc. 7th World's Poult. Congr., 1939.* pp. 136–138. 1 fig. [5 refs.] Washington, D.C.: U.S. Dep. Agric. [In English].

The distribution of P in the leg bones, liver and spleen of normal and rachitic chickens was investigated after intraperitoneal injection of radioactive sodium phosphate. By using this isotope it is possible to "label" [*V. B.* **10.** 799] the P of the diet and to follow it on its way through the organism. Twenty-two hours after injection the chickens were decapitated and the leg bones, liver and spleen removed. The provisional figures obtained from these analyses showed that the P content of the dried matter in the epiphyseal and in the diaphyseal parts of the bone is greater in normal than in rachitic chickens; also in both normal and rachitic chickens the P content of the diaphyseal part of the bone seems to be larger than that of the epiphyseal part of the same bone. Examination of the distribution of the radioactive P in both normal and rachitic chickens showed that the quantity of active P in 1 mg. of bone P was larger in the epiphysis than in the diaphysis, and that both the epiphysis and diaphysis of the rachitic birds contained a much larger quantity of the "labelled" P in 1 mg. of bone P than did similar parts of normal chickens' bones. Spleen preparations showed very little radioactivity, but the liver preparations were very active. A method of photographing the distribution of the radioactive P is described.—R. ALLCROFT.

NICHITA, G., TUSCHAK, N., & POPESCO, I. (1939). Nouvelles recherches sur l'étiologie et le traitement du rachitisme chez les poulets. **[New Research on the Aetiology and Treatment of Rickets in Pullets]**.—*Proc. 7th World's Poult. Congr., 1939.* pp. 132–136. 2 figs. Washington, D.C.: U.S. Dep. Agric. [In French: English summary].

Two series of experiments, involving a total of 70 Rhode Island Red chickens, were conducted to determine the role of confinement in the production of rickets, and to ascertain the results obtained by treatment with irradiated ergosterol. All the birds were given a complete and balanced diet with access to adequate sunlight; a certain number were confined in individual cages whereas others were given freedom of movement from the time of hatching. After five months all the chickens reared in confinement became rachitic. At this point in the first series of investigations, irradiated ergosterol was given daily for a period of three months to the confined rachitic birds. Their general condition improved greatly and X-ray examination showed an active ossification, but when these chickens were killed at the ages of 1½ and 2½ years, serious bone deformities were found. All the chickens of the second experimental series were killed at the end of five months and necropsied. The rachitic deformities noted P.M. were identical with those observed in the chickens killed at 1½ and 2½ years.—R. ALLCROFT.

SEIFRIED, O. (1939). Nährmangelkrankheiten des Geflügels. **[Deficiency Diseases of Fowls]**.—*Proc. 7th World's Poult. Congr., 1939.* pp. 291–294. Washington, D.C.: U.S. Dep. Agric. [In German: author's English summary copied *verbatim*].

The most important poultry diseases caused by malnutrition are briefly discussed.

Particular consideration was given to: A-avitaminosis, B_1-avitaminosis, rachitis, injury or calcification of inner organs due to the feeding of too much vitamin-D, cephalo-malacia due to malnutrition (Pappenheimer and collaborators) and enzootic muscular dystrophy of ducks and fowls (Seifried and Heidegger, Potel). Discussed also were exanthemas of the skin caused by vitamin-H deficiency, gout, Glage's "Kreuzrehe" and curved toes due to nutritional influences.

Where the causes of the above-named diseases have been definitely established, they may be favourably influenced through the feeding of lacking nutrients or by a change of the ratio of nutritive substances; it is necessary, however, that the diseases be treated at an early stage.

The recent experience that vitamin-A deficiency creates a particular local disposition for infection in the upper respiratory and digestive tracts is of great importance for the treatment of infectious diseases of these parts. The feeding of vitamin-A not only influences the disease caused by vitamin-A deficiency, but it also has an effect upon local infections.

Of importance is also the finding that the effect of vitamin-A deficiency upon the central and peripheral nervous system is similar to that of vitamin-B_1 deficiency.

Differentiation of deficiency diseases, with respect to their causes, may be obtained through histological investigations, which have brought us much nearer to their successful treatment.

YOUMANS, J. B. (1939). **The Influence of Vitamin Deficiencies on other Diseases.** —*Ann. intern. Med.* **13.** 980–986. [Numerous refs.]

Most of the material in this review deals with human subjects. Evidence is presented of the effect of hypovitaminosis C on pulmonary tuberculosis, diphtheria, whooping cough, rheumatic fever, and the healing of surgical wounds and peptic

ulcers. It is pointed out that in spite of the rather widely accepted belief that vitamin A is anti-infective, there are almost no significant studies of the effect of a mild deficiency on the cause of respiratory infections or other diseases. The effect of vitamin B_1 deficiency on the cardiovascular system and its relation to carbohydrate metabolism is discussed. Y. states that there is little reliable evidence of the effect of vitamin deficiencies on disease and therefore little justification for the current widespread use of vitamins as therapeutic agents in a great number of illnesses, but there is good reason to believe that vitamin deficiencies occur as complications of many diseases.—R. ALLCROFT.

HOLMES, A. D., TRIPP, F., & SATTERFIELD, G. H. (1938). **The Vitamin A Reserve of Fur-Bearing Animals.**—*Amer. J. Physiol.* **123.** 693–700. 1 table. [16 refs.]

A relatively small number of observations is reported upon the body weight, liver weight, liver fat and liver vitamin A content, as determined by the antimony trichloride colorimetric method, of certain ranch or laboratory bred mink, foxes, opossums, raccoons and rabbits, and wild mink, muskrats, skunks, opossums, raccoons, seals, bears, weasels and squirrels. In the case of 27 mink livers obtained from a fur farm, the vitamin A content per g. ranged from 2·5 to 614 Lovibond Blue Units, whereas the livers of two trapped mink had values of 744 and 1,260 L.B.U. respectively. No vitamin A could be detected in the livers of 12 raccoons which had been hibernating on a fur farm before being killed, but 14·4 L.B.U. per g. were found in the liver of a wild raccoon. The consistency of the raccoon liver and the nature of its fat are stated to differ markedly from those of all other species examined.

A comparison of the vitamin A contents of the livers of wild and ranch-reared animals showed that those of wild animals were much higher than those reared in captivity and it is suggested that the rations of ranch-reared animals do not contain sufficient vitamin A to enable the animals to accumulate optimum reserves.

—ALASTAIR N. WORDEN.

FRIDERICIA, L. S., GUDJONSSON, S., VINTRUP, B., CLEMMESEN, S., & CLEMMESEN, J. (1940). **Stomach Lesions in Rats Kept on Diets Deficient in Vitamin A.**—*Amer. J. Cancer.* **39.** 61–69. 5 tables. [Numerous refs.] [Authors' summary copied *verbatim*].

1. In four experiments (1–4) 114 rats were subjected to a diet deficient in vitamin A, either intermittently or continuously, while 74 rats were kept on a normal diet as controls. At autopsy proliferative changes in the mucosal lining of the stomach were found in 91 of the experimental rats (80 per cent), but in only 13 of the controls (18 per cent). In the stomachs of one experimental rat and one control rat histologic changes were found which suggested malignancy.

2. In a fifth experiment, 21 rats which survived an exploratory laparotomy after they had been kept for eighteen weeks on alternating A-deficient and normal diets, showed lesions of the mucosa of the stomach, but in only 2 of these were such lesions observed when they were killed after having been restored to a normal diet for one year.

From the results of these experiments, it is concluded that vitamin A deficiency must have been in a great measure a determining factor in the production of the stomach changes, though it must be assumed that other factors, as yet unknown, play an important part. The theory proposed in a recent editorial in the Lancet, that a virus infection may be instrumental in determining the development of the lesions, is neither confirmed nor refuted by the results of the present experiments.

HARRIS, L. J. (1937–1938). **The Vitamin B_2 Complex. Differentiation of the Antiblacktongue and the P.-P. Factors from Lactoflavin and Vitamin B_6. VII. Experiments with Monkeys and Other Species. VIII. Further Notes on " Monkey Pellagra " and Its Cure with Nicotinic Acid.**—*Biochem. J.* **31.** 1414–1421, and **32.** 1479–1481. 9 figs., 1 table. [Numerous refs.]

I. Monkeys fed a basal diet consisting of a modification of Goldberger's blacktongue diet supplemented with orange juice developed loss of appetite, diarrhoea, vomiting, emaciation and ultimately death. They were protected from the disorder by concentrates or supplements known to contain the P.-P. (or anti-blacktongue) factor, *viz*, Eli Lilly " 343 " liver extract powder or yeast, or by the substitution of whole wheat for the maize of the basal diet. It is concluded that the third portion of the vitamin B_2 complex, distinct from lactoflavin and vitamin B_6, is concerned in protection against this disease of monkeys ; it is also necessary for the prevention of pellagra in human beings and blacktongue in dogs.

The comparative needs of rats, dogs, monkeys and pigeons for the several components of the vitamin B_2 complex are discussed.

II. The characteristic symptoms of " monkey pellagra " described in I were produced in monkeys fed the basal diet referred to above, further supplemented with " radiostoleum ". Administration of nicotinic acid in daily doses of 5 mg. per 2 kg. body weight, or 10 mg. per 4 kg. body weight was found consistently effective in curing the disorder.—R. ALLCROFT.

SCHUMACHER, A. E., & HEUSER, G. F. (1939). **The Importance of Riboflavin in Reproduction in Poultry.**—*Poult. Sci.* **18.** 369–374. 2 figs., 5 tables. [8 refs.]

The results of feeding an 11 μg. supplement of crystalline riboflavin to three groups of hens, two of which were on a riboflavin-deficient ration, showed that the increase in the hatchability of the eggs was almost immediate.

Supplementary feeding of various levels of riboflavin showed that hatchability varies with individuals and that the improvement in hatchability depends on the level of riboflavin in the diet and the original response of the birds. A riboflavin deficiency in the diet of the hen is reflected in the riboflavin content of the egg which affects embryonic growth and the condition of the chicks at hatching. The first and second week embryonic mortality was affected to a greater extent than the third week mortality. The embryos of the hens fed riboflavin-deficient or riboflavin-low rations showed, in addition to retarded growth, the characteristic curled toe or nutritional leg paralysis often noted in growing chicks fed a riboflavin-low ration. Injections of varying amounts of riboflavin into hens, and injection of 75–80 μg. riboflavin into eggs, had no effect on hatchability. It is suggested that riboflavin may not be utilized as such and is not available to the developing embryo.—S. G. IYER.

PHILLIPS, P. H., & ENGEL, R. W. (1938). **The Histopathology of Neuromalacia and " Curled Toe " Paralysis in the Chick Fed Low Riboflavin Diets.**—*J. Nutrit.* **16.** 451–468. 8 figs. [9 refs.]

Experiments on White Leghorn chicks demonstrated that a low riboflavin diet may cause two types of nutritional deficiency—one, a rapidly acute paralysis characterized as neuromalacia, and the other a more slowly developing form which causes " curled toe " paralysis in the growing chick. This disorder was accompanied by specific neuropathology of the main peripheral nerve trunks. Degenerative changes appeared in the myelin of the nerves, accompanied by Schwann cell proliferation and axis cylinder swelling and fragmentation. Histological changes

also occurred in the spinal cord where myelin changes, gliosis and chromatolysis were observed. Degeneration of the neuro-muscular end plates and muscle fibres frequently accompanied the paralysis.

It is concluded that riboflavin is necessary in the growing chick for the normal function and maintenance of the nervous system, particularly the main peripheral nerve trunks, and it may be specifically associated with myelin metabolism.—R. A.

HARVEY, H. I., SMITH, D. T., PERSONS, E. L., & BURNS, Margaret V. (1938). **The Effect of Various Fractions of Liver on Experimental Canine Blacktongue.**—*J. Nutrit.* **16.** 153–171. 4 figs. [Numerous refs.]

From observations on dogs conducted over a period of four years it was concluded that :– (1) simple aqueous extracts of liver are potent in the cure of canine blacktongue ; (2) that extracts of liver prepared for parenteral use in pernicious anaemia are only partially successful, even in large doses ; (3) that the residue from the preparation of these parenteral liver extracts is potent in a dosage comparable to the amount of the same material which is potent for pernicious anaemia and sprue in man, and (4) that the parenteral extract can apparently replace a part but not all of the residue material.

It is concluded that these results are not consistent with the possibility that nicotinic acid, which is also effective in the cure of blacktongue, is present in therapeutically significant amounts in either or both fractions of liver tested. It is suggested that two substances are present in liver, and that both are necessary for the elaboration of some compound (probably a nicotinic acid complex) which is potent in the cure of experimental blacktongue in dogs and pellagra in man.

A method suitable for the assay of the blacktongue curative potency of any substance which can be administered to dogs is described.—R. ALLCROFT.

EDGAR, Constance Elizabeth, MACRAE, T. F., & VIVANCO, F. (1937). **The Water-Soluble Vitamins. VII. Growth-Promoting Properties of Lactoflavin.**—*Biochem. J.* **31.** 879–885. 3 figs., 2 tables. [Numerous refs.] [For previous parts, see *V. B.* **6.** 901].

EDGAR, Constance Elizabeth, & MACRAE, T. F. (1937). **The Water-Soluble Vitamins. VIII. Essential Dietary Factors for the Rat Present in Autoclaved Yeast Extracts in Addition to Lactoflavin. IX. Properties of the Dietary Factor Contained in the Fuller's Earth Filtrate from Autoclaved Yeast Extracts.**—*Ibid.* 886–892 and 893–902. 2 figs., 3 tables. [Num. refs.]

MACRAE, T. F., & EDGAR, Constance Elizabeth. (1937). **The Water-Soluble Vitamins. X. Nicotinamide and other Pyridine Derivatives in the Nutrition of the Rat.**—*Ibid.* 2225–2231. 3 figs., 4 tables. [16 refs.] [Authors' summary copied *verbatim*].

EDGAR, Constance Elizabeth, EL SADR, M. M., & MACRAE, T. F. (1938). **Water-Soluble B Vitamins. XI. The Estimation of Yeast Eluate Factor and Yeast Filtrate Factor by Rat Growth Methods. XII. The Preparation from Liver of Fractions Containing the same Dietary Essential Factors for the Rat as Yeast Eluate Fraction and Yeast Filtrate Fraction.**—*Ibid.* **32.** 2200–2206 and 2225–2230. 1 fig., 5 tables. [Numerous refs.] [Authors' summaries copied *verbatim*].

EL SADR, M. M., MACRAE, T. F., & WORK, C. Elizabeth. (1939). **The Water-Soluble B-Vitamins XIII. Alloxazine-Adenine-Dinucleotide, Adenylic Acid, Nicotinamide and Pimelic Acid in the Nutrition of the Rat. XIV. Note on the Yeast Eluate Factor of the Vitamin B_2 Complex.**—*Ibid.* **33.** 601–610 and 611–612. 3 tables. [Numerous refs.]

VII. From growth tests carried out on young rats it is considered that lactoflavin [riboflavin] is the member of the heat-stable vitamin B_2 complex which is especially concerned in the growth of rats. The growth response to lactoflavin was greatly enhanced by the addition of extracts from wheat germ or from yeast, but when these materials were given without lactoflavin, no increase in weight occurred.

VIII. Two heat-stable factors, necessary for the optimum growth of rats maintained on a vitamin B free diet and receiving lactoflavin and vitamin B_1, were separated from yeast. One factor was found to be present in the filtrate, after exhaustive extraction with fuller's earth of an autoclaved acid aqueous yeast extract, while the second is contained in the eluate from the fuller's earth adsorbed after the removal of the lactoflavin. The growth rates of rats receiving both the eluate and filtrate fractions supplemented by vitamin B_1 and optimum doses of lactoflavin were similar to those of rats receiving a good mixed diet of natural foodstuffs.

IX. The results are given of an investigation of the physical and chemical properties of the filtrate factor found in aqueous autoclaved yeast extracts after repeated adsorption with fuller's earth in acid solution. A comparison is also given of its properties with those of other heat-stable factors of the vitamin B complex described by other workers.

X. Neither nicotinic acid, nicotinamide or codehydrogenase II could replace either the yeast filtrate factor or the yeast eluate factor in the diet of the rat as tested by observations on growth.

Amyl alcohol extracts prepared from liver extracts contain a growth factor for rats which is distinct from the anti-blacktongue factor contained in such preparations, identified by Elvehjem *et al.* [*V. B.* **9.** 108.] as nicotinamide.

XI. 1. Rat growth methods are described for the determination of yeast eluate factor (vitamin B_6 of György; factor 1 of Lepkovsky) and yeast filtrate factor (factor 2 of Lepkovsky).

2. In both methods graded growth responses to graded doses of the factors were observed, and although the suitability of these tests for the accurate biological determination of these factors has not been worked out, the probability is that these methods, perhaps with some modifications, will prove satisfactory.

XII. 1. Fuller's earth treatment of liver extracts did not yield fractions with the same dietary essentials for the rat as did similar treatment of autoclaved yeast extracts.

2. Fractions with the same growth-promoting properties for rats as the yeast eluate fraction and yeast filtrate fraction were obtained from liver extracts by other methods.

XIII. Using the growth of young rats as the criterion of vitamin activity, the authors demonstrated that alloxazine-adenine-dinucleotide had no nutritive value other than its activity as a substitute for riboflavin in the diet of the rat; equimolecular amounts of these compounds have the same nutritive potency. A combination of adenylic acid and nicotinamide had no growth-promoting properties for rats receiving diets deficient in the yeast eluate factor (vitamin B_6) or the yeast filtrate factor of the vitamin B_2 complex, and in rats deprived of eluate factor, it did not influence the development of dermatitis. Pimelic acid did not replace yeast filtrate factor in the diet of the rat.

XIV. Biological and chemical investigation showed that yeast eluate factor is identical with factor 1 [Lepkovsky *et al.* (1936.)], and probably with vitamin B_6 [György (1935)].—R. Allcroft.

PHILLIPS, P. H., RUPEL, I. W., OLESON, J. J., & BOHSTEDT, G. (1938). **The Effects of an Atypical Blindness-Producing Ration Upon the Vitamin K and C Content of Calf Blood.**—*Proc. 31st ann. Meet. Amer. Soc. anim. Prod. 1938.* pp. 320–327. 1 fig., 2 tables. [8 refs.]

One of a group of three 8–10 weeks old Holstein heifer calves was slaughtered, and the vitamin A and riboflavin contents of its liver determined. The other calves were each given a basal diet identical with the " atypical blindness-producing ration " employed by WALKER [*Thesis, Wisconsin.* (1936.)], but one received also a daily supplement of crystalline carotene, dissolved in Wesson oil, equivalent to 100 γ per kg. body weight. The animals were maintained on experiment for 30 weeks, during which time the one receiving the carotene supplement remained in normal health and almost doubled its weight ; the other calf, however, put on weight for a few weeks only, and suffered intermittently from lachrymation and diarrhoea, while the clotting time of its blood was increased, only to be reduced to normal by the administration of a vitamin K concentrate. Determination of the serum-carotene, plasma- and urine-ascorbic acid levels throughout the experiment, and of the carotene and riboflavin contents of the liver at autopsy, gave far higher values for the calf receiving the carotene supplement, while histological examination indicated pathological changes in the spinal cord, sciatic nerves, lungs, liver and kidneys of the calf which received only the basal diet.—A. N. W.

PUBLIC HEALTH

KAY, H. D., ASCHAFFENBURG, R., & NEAVE, F. K. (1939). **The Phosphatase Test for Control of Efficiency of Pasteurization.**—*Tech. Comm. Imp. Bur. Dairy Sci.* No. 1. pp. 54. 3 figs., 5 tables, 1 appendix. [Numerous refs.] Shinfield, Reading : Imperial Bureau of Dairy Science. [4to] [2s.]

Total destruction of the pathogenic organisms which may be present in raw milk is the chief aim of the laws relating to pasteurization and controls the choice of conditions for effective heat treatment. In the introduction to this bulletin the authors survey the various methods which have been proposed for controlling the efficiency of pasteurization. They point out that tests based on physico-chemical changes in the milk are not well adapted to variable conditions, and that critical studies based on the destruction of enzymes in the milk have shown more promise. The main requirement for a pasteurization test based on practically complete destruction of an enzyme is that the heat resistance of the enzyme should be slightly, but only slightly, greater than the thermostability of the pathogenic organisms likely to occur in milk. The only criterion which fulfils this requirement is the phosphatase test first developed by KAY and GRAHAM in 1933. This test, however, in its original form was not very sensitive to slight defects in pasteurization and a drastically changed test was introduced by the same workers in 1935 [*V. B.* **6.** 542.]. The method for carrying out this test is fully described in an appendix together with later modifications made by KAY and NEAVE (1937) and NEAVE (1939). Other modifications of the test suggested by GILCREAS and DAVIES [*V. B.* **9.** 110.], and the Association of Official Agricultural Chemists (1938, 1939), by SCHARER (1938, 1939), by LEAHY (1938, 1939), and by ASCHAFFENBURG and NEAVE (1939) are described. Various factors affecting the reliability of the test are dealt with. There is little information on the effect of mastitis on the test apart from that of ASCHAFFENBURG and NEAVE (1939) which indicates that the phosphatase activity of " mastitis milk " tends to be higher than normal, both before heating and after proper pasteurization. The application of the phosphatase test to H.T.S.T.

pasteurization is considered, and the authors conclude that the test remains sensitive under this type of pasteurization, but that further experimental evidence is required to settle a number of details. After surveying the attempts which have been made to apply the test to milk products, *e.g.* cream, skim milk, butter, cheese and ice-cream, the authors state that owing to the injudicious manner in which it has been used, careful laboratory investigations are required to put the test on a more satisfactory basis for these products.—N. J. SCORGIE.

I. FRANCE. (1939). Décret du 26 avril 1939 relatif au contrôle des ateliers de pasteurisation. [**Decree of 26th April, 1939, relating to the Control of Pasteurization Plants**].—*Rec. Méd. vét.* **115.** 494–499.

II. FRANCE. (1939). Décret du 28 avril 1939 relatif à la vente du lait à l'état cru pour la consommation humaine. [**Decree of 28th April, 1939, relating to the Sale of Raw Milk for Human Consumption**].—*Ibid.* 499–505.

I. By this decree the temperature of pasteurization plants must be registered by an approved device, and the charts so recorded kept for a period of six months. Pasteurized milk will be of two designations, *viz*, (1) " milk ", which shall be free from pathogenic organisms, and contain not more than 100,000 bacteria per c.c., and (2) " certified pasteurized milk ", which shall be free from pathogenic organisms, give a negative reaction for coliform bacilli (*Escherichia* and *Aerobacter*) in 1 c.c. of the milk, and contain less than 30,000 bacteria per c.c. ; this milk shall be sold in sealed bottles not exceeding 1 litre content and shall bear the appropriate designation. Both classes of milk shall bear no other lettering or advertisement than that prescribed. The decree sets up a commission, which includes the chief of the veterinary services, to advise the Minister of Agriculture on matters relative to the application of the decree. Included in the decree are articles dealing with conditions of registration and inspection of pasteurization plants.

II. Under the decree the only designation for raw milk will be " unpasteurized milk ". Producer-retailers whose herds are free from tuberculosis may label their milk churns with a blue band bearing the inscription " Milk produced from known tuberculosis-free animals ". The decree contains articles dealing with the registration and control of collecting depots, co-operative dairies and other enterprises engaged in the sale of raw milk. A commission is created to advise the Minister of Agriculture on the application of the decree. Inspection of raw milk for human consumption will be undertaken by the veterinary service and other departments of the Ministry of Agriculture. The decree further provides for the introduction of a bye-law dealing with the hygienic and bacteriological conditions to which raw milk must conform, together with the special conditions for sampling, approved laboratories and the methods of analysis to be employed.—N. J. SCORGIE.

I. SANDBERG, I. (1939). Tierärztliche Lebensmittelhygiene in Schweden. [**Veterinary Food Hygiene in Sweden**].—*Z. Fleisch- u. Milchhyg.* **50.** 7–9. 2 tables.

II. TARNAALA, K. (1939). Von der Lebensmittelhygiene in Finnland. [**Food Hygiene in Finland**].—*Ibid.* 12–14.

III. EMOTO, O. (1939). Ein kurzer Beitrag zur Kontrolle der animalischen Nahrungsmittel in Japan. [**Supervision of Foods of Animal Origin in Japan**].—*Ibid.* 14–15.

IV. AASER, C. S. (1939). Die veterinäre Nahrungsmittelkontrolle in Norwegen. [**Veterinary Supervision of Foodstuffs in Norway**].—*Ibid.* 22–23.

V. UNGER, J. (1939). Die Entwicklung der Milch- und Fleischhygiene in der Schweiz. [**Development of Milk and Meat Hygiene in Switzerland**].—*Ibid.* 31–32 and 41–44.

I. In Sweden meat inspection is regulated by the Meat Inspection Law of 1897, which was revised in 1913 and again in 1934. Three forms of meat inspection are provided for :– at public abattoirs in the eight largest towns, at 170 town or district inspection offices and at controlled abattoirs which were formerly concerned with the export trade, but now operate for general purposes. The work is done by veterinarians.

Milk inspection is regulated by the Hygiene Law of 1919, the Dairies Order of 1936 and the Pasteurization Order of 1939. The Hygiene Law requires that market milk shall come from healthy cows, but it is in force only in the larger towns, which can afford the costs incurred. Most towns have their own regulations. The Dairies Order sets standards for cow byres and dairies and requires the medical inspection of all farm and dairy personnel. By the Pasteurization Order all milk except that from TB.-free herds must be heated.

II. By the Meat Inspection Law of 1922 towns or districts with a population exceeding 4,000 must have a meat inspection service, whilst smaller communities may have one if they desire. Veterinarians are entrusted with the work, after passing a proficiency test. Meat in country districts is inspected at special centres. Finnish cattle are remarkably free from disease so there is very little detention or condemnation of carcasses.

There is no country-wide milk inspection law, but local authorities have the power to regulate milk production and distribution. Helsingfors has a model milk control organization, which is so effective in ensuring the supply of " safe " milk that pasteurization is not resorted to at all. There is a Milk Law projected, by which milk control will be made compulsory in towns and districts having over 4,000 inhabitants.

III. This is a short note giving figures for the annual value of meat and dairy products sold in Japan and for milk and meat control ; the system follows European practice.

IV. In Norway meat and milk inspection are regulated by the Health Law of 1860, the Abattoir and Meat Inspection Law of 1892 and the Foodstuffs Law of 1933, with various amendments. Meat inspection must be carried out by veterinarians in all towns and districts with over 4,000 inhabitants : in 1937 this was being done in 35 towns and two districts. The 1892 law is now being revised.

Milk control is in the hands of local authorities and is not yet greatly developed ; only 17 towns have any regulations in force.

V. By a law of 1906 every " Gemeinde " had to appoint a veterinary meat inspector and all meat for human consumption had to be inspected. Extracts from the law are given. New detailed instructions on meat inspection were issued in a Federal Meat Inspection Law of 1939.

Milk was not controlled until the law of 1906 was amended in 1936, when it was placed under the control of the Canton chemist, who regulates quality tests, etc. In case, however, of milk-borne disease, veterinary officials are called in to trace and deal with diseased cows. The highest quality milk (" Vorzugsmilch ") is produced from cows which have passed the tuberculin and brucella-agglutination tests and are kept and milked in the best hygienic conditions.—J. E.

ANON. (1940). **Food-Poisoning.**—*Brit. med. J.* June 1st. 896–897. [9 refs.]

During the decade 1929–38, some 686 outbreaks of food poisoning were reported to the Ministry of Health ; 319 of these outbreaks were traced to salmonella infection, and 163 were " toxin outbreaks ". The question of food poisoning assumes added importance in war-time, when the routine preparation and distribution of foodstuffs may be dislocated, and whereas almost any form of food may

become contaminated with an organism of the salmonella group through human or rodent agency, certain products of animal origin, *viz*, meat, eggs and milk, may be specifically dangerous owing to their retention of an infection present during the life of the animal from which they were derived. In the case of salmonella infection, rapid and accurate detection and isolation of the causal organism are essential, and it is considered that for this purpose the use of two or more of the existing methods, none of which is in itself ideal, is the best routine measure. [There would appear to be an erroneous reference to the fact that RUYS, in several years' work, " found that brilliant-green-picric-citric-acid plates gave the best chance of detection of the Salmonellas ". This worker used, in fact, a brilliant-green-picric-citric-acid broth.]

" Toxin outbreaks " have usually been traced to staphylococcal enterotoxins, various canned or potted products, as well as meat pies, having been incriminated. MINETT [*V. B.* **9.** 113.] has produced enterotoxin from staphylococci present in a cow's diseased udder.—ALASTAIR N. WORDEN.

THERAPEUTICS

SMITH, Elizabeth R. B. (1940). **A Comparison of the Effects of Large Doses of Calcium Gluconate-Idonate, Calcium Gluconate, and Calcium Chloride.**—*J. Lab. clin. Med.* **25.** 1018–1021. 1 fig., 1 table. [3 refs.] [Author's summary copied *verbatim*].

Calcium chloride, whether given orally to rats or intravenously to dogs, is definitely more toxic than calcium gluconate-idonate or calcium gluconate.

Calcium gluconate-idonate and calcium gluconate differ very little in their toxicity for dogs and rats. Over a long period of time (seventy days) calcium gluconate proved lethal to 2 of 10 rats, and calcium gluconate-idonate to none of 10.

Intravenous injections of 0·205 M solutions continued to the point of cardiac arrest (usually with ventricular fibrillation) revealed no differences between the effects of calcium gluconate and calcium gluconate-idonate.

HIGNETT, S. L., & KING, W. S. (1940). **Streptococcal Infection in the Commercial Horse.**—*Vet. J.* **96.** 81–84. [9 refs.]

The chief streptococcal infections met with in horses are briefly reviewed and their treatment discussed. Sulphanilamide has been found effective in treatment especially in streptococcal pneumonia and strangles, the test dose being 3–5 dr. per cwt. live weight. The authors have had disappointing results from this drug in long standing localized infections, *e.g.* chronic sinusitis.—F. T. BOYLE.

SIEBERT, W. J., & LOOSE, F. (1940). **Observations on a Sulfanilamide Solution.**—*J. Lab. clin. Med.* **25.** 1062–1066. 2 charts. [4 refs.] [Authors' summary copied *verbatim*].

1. In the guinea pig and rabbit higher blood concentrations of free sulfanilamide are obtained when the drug is given as the solution than when it is administered in equivalent doses in other forms.

2. The rate of elimination of the sulfanilamide is no more rapid when given as the solution than when given in other forms.

3. The sulfanilamide appears in the blood more rapidly when given as the solution than when administered in other forms.

4. Sulfanilamide solution, therefore, may be expected to be as effective in the treatment of certain infections as any other form of sulfanilamide.

5. From the experimental evidence presented, it can be concluded that there are probably fewer toxic side actions with the sulfanilamide solution than with sulfanilamide in the form of the dry drug when administered in sulfanilamide equivalent dosage.

FOLLIS, R. H., JR., & RICH, A. R. (1939). **Further Studies on the Effect of Sulfanilamide on Experimental Tuberculosis.** *Bull. Johns Hopk. Hosp.* **65.** 466–486. 9 figs. on 2 plates, 5 tables. [14 refs.] [Authors' summary copied *verbatim*].

The present study of the effect of sulfanilamide on experimental tuberculosis in the rabbit confirms the result of our previous study on the guinea pig, demonstrating that adequate dosage of the drug, properly administered, has a definite inhibitory effect upon the development of the disease.

Individual rabbits exhibit marked differences in the degree to which they acetylate the drug, and in their ability to attain and maintain a high concentration of the drug in the blood following the administration of a given dosage. These differences undoubtedly play a rôle in determining the degree to which a given dosage of the drug will exert a beneficial effect upon the progress of the infection in different animals.

We wish to stress the fact that no conclusions regarding the effect of the drug upon human tuberculosis should be drawn from these experiments. That is a problem that requires a separate and carefully controlled study.

I. ANON. (1939). **Chemotherapy and the White Cells.**—*Lancet.* **237.** 147.
II. COLEBROOK, L. (1939). **Chemotherapy and the White Cells. [Correspondence].**—*Ibid.* 158–159.

I & II. The sulphonamide drugs tend to decrease the white cell count of the blood and agranulocytosis occurs in a small number of patients. This complication can be fatal and may occur after treatment with any of the drugs of this group. The great majority of patients who develop agranulocytosis have received high doses of the drug. It is suggested that periodic white cell counts should be made in patients who do not show an immediate response to treatment with the sulphonamide drugs. Both blood transfusion and administration of pentnucleotide are useful in the treatment of agranulocytosis.—J. M. ROBSON.

MOLITOR, H., ROBINSON, H., & GRAESSLE, O. (1939). **Some Pharmacological and Toxicological Properties of Sulfanilamide and Benzylsulfanilamide.**—*J. Pharmacol.* **65.** 405–423. 4 figs. [Numerous refs.]

In oral toxicity tests the L.D. 50 of sulphanilamide was 4·8 g. per kg. in mice, 6·2 g. per kg. in rats and 3 g. per kg. in rabbits. Oral administration of benzylsulphanilamide did not produce death at any dose level. When the drugs were fed daily in fractionated doses for 10 consecutive days, the toxicity of benzylsulphanilamide remained practically unchanged while that of sulphanilamide was somewhat increased. When fed for periods of 32–120 days, benzylsulphanilamide remained non-toxic, while the toxicity of sulphanilamide became more pronounced; the sulphanilamide-injected animals showed enlargement of the spleen and occasional degenerative changes in the liver and kidney. The liberation of sulphanilamide in animals fed with benzylsulphanilamide was determined, and found to be sufficient to account for the therapeutic properties of the latter compound.

—J. M. ROBSON.

CARDOSO, D. M., NOBREGA, P., & REIS, J. (1938). Ação da sulfanilamide sobre a infecção por " Pasteurella avicida " em aves. [**Action of Sulphanilamide in Fowl Cholera**].—*Arq. Inst. biol., S. Paulo.* **9.** 253–260. 5 tables. [4 refs.] [English summary].

The authors report on the effect of sulphanilamide on experimental fowl cholera. White Leghorns received a single intramuscular injection into the pectoral muscle of an oily suspension of the drug, the dose varying from 0·5–1 g. The birds were then infected with a highly pathogenic strain of *Past. aviseptica.*

Quantitative tests of sulphanilamide in the blood were carried out and it was found that a concentration of 6–10 mg. per 100 c.c. was attained six hours after injection. The larger doses of the drug were found to be more satisfactory than the smaller ones which were eliminated too quickly. With a dose of 1 g. an effective concentration was maintained for 60 hours.

Under the most favourable conditions 78% of the birds treated survived infection with *Past. aviseptica.* They were kept under observation for a long period as some birds died as much as 28 days after infection. Birds which survived showed marked immunity to the disease when tested about one month later.

—MILLER WATSON.

PULLAR, E. M. (1939). **The Treatment of Actinomycosis by the Intravenous Administration of Sodium Iodide.**—*Aust. vet. J.* **15.** 104–117. 3 figs. 1 table. [14 refs.]

Approximately 1,800 cattle are annually found in Victoria to be infected with actinomycosis. Sixteen cows affected with various types of the disease were treated by intravenous administration of sodium iodide in an attempt to confirm FARQUHARSON'S results [*V. B.* **8.** 389]. A simple apparatus is described for intravenous administration of large doses of fluid. Most animals were given a dose of 30 g. sodium iodide in a pint of distilled water irrespective of size. No serious effects attributable to the drug were observed, although 12 of the cows were pregnant.

In four cases of actinobacillosis of the tongue the lesions completely resolved after one treatment, the cures being checked at autopsy. Cases of actinobacillosis involving bones, and cases of true actinomycosis (streptothrix infection) involving either soft tissues or bone, showed decided clinical improvement after two or three treatments. Advanced cases, however, were not cured by the intravenous injection of the iodine alone and surgical treatment was purposely withheld. Two cases of staphylococcal " actinomycosis " of the udder showed no response. This promising treatment for actinomycosis is being further investigated.—W. I. B. B.

SCHERN, K. (1939). Die englischen Forschungen über Synthalin (Dekamethylendiguanidin), ein deutsches Heil- und Vorbeugungsmittel gegen Trypanosomeninfektionen. [**British Research on Synthalin (Dekamethylendiguanidin), for the Prevention and Cure of Trypanosomiasis**].—*Berl. Münch. tierärztl. Wschr.* Nov. 3rd. 655–657. [2 refs.]

The conclusion of WARRINGTON YORKE [*V. B.* **9.** 659.] and his collaborators that synthalin and chemically related drugs are directly trypanocidal, and that their value in the treatment of trypanosomiasis is not dependent on their action in reducing blood sugar, is criticized on the grounds that it was formed as a result of work in test tubes, and did not take into consideration the action of the drugs on the vital processes of the host animal. It is pointed out that although SCHERN and ARTAGAVEYTIA [*Z. ImmunForsch.* **89.** 484.] classed synthalin treatment as " glycoprive " [sugar depriving] they agreed that it also possessed some toxic

property, and thus differed from other similar drugs which reduce blood sugar but are not trypanocidal. S. was not able to obtain definite confirmation of the trypanocidal action of synthalin *in vitro* and considers that the result may depend upon the stage of the trypanosome infection.—U. F. Richardson.

Reimann, S. P., & Toennies, G. (1940). **Reaction of Mouse Skin to Various Reduced and Partially Oxidized Sulfur Compounds.**—*Arch. Path.* **29.** 175–180. [16 refs.] [Authors' summary copied *verbatim*].

Mouse skins have been rubbed with thiocresol, cysteine sulfinic acid, cystine, cystine disulfoxide, dl-methionine, methionine sulfoxide and dibenzanthracine. The sulfhydryl compound increased the rates of cell proliferation and the cells subsequently differentiated and organized to higher degrees than in normal skin. The other compounds showed no such effects. Some of the chemical relationships of these compounds are discussed in the light of their biologic behavior on mouse skin as well as in feeding and other experiments.

On correlating these findings with the general knowledge of growth and development, it is again concluded that malignancy begins in incompletely differentiated cells or " spare parts ", that the changes of malignancy are qualitative changes in cell potencies and on the basis of these considerations and others a definition of a malignant growth is again proposed as follows : A malignant growth is a mass of cells which arise from and continue to proliferate within an organism as a result of and in direct proportion to their degree of internal qualitative difference from the other cells of the organism with respect particularly to the potencies of differentiation and organization.

Goff, O. E., & Upp, C. W. (1940). **Effect of Four Grades of Sulphur upon Artificially Produced Coccidiosis. Preliminary Report.**—*Poult. Sci.* **19.** 180–186. 2 tables. [11 refs.]

The grades of sulphur are described in tabular form. Rations containing sulphur and/or charcoal were so adjusted with protein concentrates that the protein content was essentially the same in all. Charcoal was included in the ration as it had no apparent value in preventing deaths from coccidiosis when used in combination with sulphur. The most promising results were obtained with the finer grinds of sulphur used. Coccidia-infected chickens continued to pass viable oocysts after treatment with any grade or quantity of sulphur, and these oocysts, when sporulated, were capable of producing clinical evidence of the disease.—C. Horton Smith.

I. Gordon, H. McL. (1939). **The Efficiency of Copper Sulphate and Carbon Tetrachloride Against** *Haemonchus contortus* **in Adult Sheep.**—*Aust. vet. J.* **15.** 118–120. 1 table. [7 refs.]

II. Edgar, G. (1939). **The Anthelmintic Efficiency of " Lentin " Against the More Important Internal Parasites of Sheep.**—*Ibid.* 172–176. 4 tables. [1 ref.]

III. Gordon, H. McL. (1939). **The Efficiency of Various Concentrations of Solutions of Copper Sulphate Against** *Haemonchus contortus.*—*Ibid.* 216–218. 1 table. [3 refs.]

I. The dose of copper sulphate usually prescribed (1 fl. oz. of 4% solution) was not an efficient anthelminthic against *H. contortus* in adult sheep. Doses of 2 fl. ozs. of 4% copper sulphate solution (double the usual dose) and doses of 2 ml. carbon tetrachloride in 3 ml. liquid paraffin were very effective.

II. " Lentin ", in doses slightly exceeding those recommended against strongyle infestation in sheep by the manufacturers, was not efficient against *H. contortus*, *Trichostrongylus* spp. or *Oesophagostomum columbianum*. In sheep in poor condition " lentin " was highly toxic.

III. In the treatment of haemonchosis in young sheep with copper sulphate it was found that a 2% solution was efficient (*i.e.* reduced the egg count by 70% or more) in a greater proportion of cases (81·2%) than either a 0·5% solution (66·6%) or a 10% solution (29·4%), although the difference in efficiency between 2% and 0·5% solutions was not statistically significant. In practice a very large or very small bulk of fluid per dose is undesirable, and it appears that a 4% solution gives about optimum dose rates.

YOSIKAWA, M., & SOMAZAWA, K. (1939). **Experimental Studies on Anthelmintics for the Stomach Worm (*Haemonchus contortus*) in Sheep. II. Experiments on the Anthelmintic Action of Carbon Tetrachloride Emulsion, and Critique on the Efficacy of Copper Sulphate.**—*Jap. J. vet. Sci.* **1.** 617–632. 6 figs., 2 tables. [16 refs.] [In Japanese : abst from English summary]. [Publication containing part I not yet available].

Gastrotomy was performed on the fourth stomachs of experimental sheep prior to treatment, in order to determine accurately the number of live worms present. Gastrotomy was again performed following treatment, to determine the percentage of dead worms present. These observations were finally checked by a careful P.M. examination. An emulsion, containing 50 c.c. carbon tetrachloride, 50 c.c. 70% alcohol and 8 g. medicinal soap, thoroughly mixed, was found to have a strong anthelmintic action. The complete removal of stomach worms was effected by 0·4 c.c. per kg. body weight of the emulsion in 50–100 c.c. of water, given after a 24 hours' fast. The toxic action of the drug thus administered is slight. A single or double medication with 100 c.c. of a 1·5% aqueous solution of copper sulphate does not result in complete removal of the worms.—R. FISHER.

I. LIPSON, M. (1939). **Chemical Studies in Connexion with the Dosing of Sheep with Phenothiazine.**—*J. Coun. sci. industr. Res. Aust.* **12.** 342–344. 3 tables. [4 refs.]

II. GORDON, H. McL. (1939). **A Preliminary Note on the Anthelmintic Efficiency of Phenothiazine against *Trichostrongylus* Spp. in Sheep.**—*Ibid.* 345–347. [7 refs.]

I. A method for the purification of commercial phenothiazine is described. It consists of solution of the commercial product in boiling benzene, filtration through alumina, evaporation, and purification of the residue by washing with hot petroleum ether. For preparing large amounts of phenothiazine, filtration is replaced by shaking a hot benzene solution with alumina and allowing to stand. The resulting red solution is filtered, evaporated to small bulk and cooled. The addition of petroleum ether precipitates phenothiazine.

A method for the quantitative estimation of phenothiazine in sheep faeces is also described. A faecal sample, about 10 g., is weighed, dried at 100°C. for 2 hours, re-weighed and Soxhlet-extracted with alcohol for 4 hours. On cooling, the extract is made up to 100 ml., and an aliquot portion is measured out and used in estimating phenothiazine by the method of EDDY and DE EDS [*Food Research.* **2.** 305. (1937)].

II. An introductory note deals with investigations carried out in the search for an anthelmintic possessing efficiency against *Trichostrongylus* spp. inhabiting

the small intestine of sheep. The copper sulphate : nicotine sulphate mixture, and tetrachlorethylene following copper sulphate, are referred to briefly.

Experiments with phenothiazine are described in which doses of 0·15 to 0·6 g. per kg. body weight were used. At the higher rate the drug was very efficient against trichostrongyles. A dose rate of 0·3 g. per kg. gave satisfactory results in a large proportion of cases. Doses of 0·15 g. per kg. were not efficient. With the higher dose rates, efficiency did not appear to be influenced by the route of the drug when swallowed, but was equally great whether the drug was administered in gelatin capsules, or as a suspension shaken up with copper sulphate solution. (Capsules are almost invariably swallowed into the rumen.)

I. Roberts, F. H. S. (1939). **The Value of Phenothiazine in the Treatment of Oesophagostomiasis in Sheep.**—*Aust. vet. J.* **15.** 237–244. 7 tables. [7 refs.]

II. Gordon, H. McL. (1939). **The Anthelmintic Efficiency of Phenothiazine.** —*Ibid.* 245–252. 4 tables. [9 refs.]

I. Tests with " thiox ", a preparation containing 93% phenothiazine, with beta-naphthol and a wetting agent, which were carried out on over 80 sheep, showed it to be a safe and efficient anthelmintic against *O. columbianum*. Satisfactory results were obtained by using a dose rate of 0·15 g. per lb. body weight given immediately after stimulation with 2 ml. of 10% copper sulphate and following 24 hours' starvation, and also by employing a dose rate of 0·4 g. per lb. body weight given without copper sulphate or previous starvation. The preparation was administered shaken up in water (the wetting agent in " thiox " renders possible a temporary suspension of the insoluble material). Some sheep (about 15% in the experiments described) responded poorly to treatment even when the higher dose rate was used. This was thought to be associated with a tendency to constipation, the quantity of ingesta in the colon at the time of treatment and the condition of the sheep (there were indications that anthelmintic efficiency was greater in sheep in poor condition than in sheep in good condition). It was observed that the drug was very efficient against *Haemonchus contortus* but quite inefficient against *Trichuris* spp.

II. Following a short historical review of the use of this drug, experiments are described which demonstrated it to be a highly efficient anthelmintic against *Haemonchus contortus*, *Oesophagostomum columbianum* and *Trichostrongylus* spp. of sheep. Phenothiazine was found to prevent the development of larvae in faecal cultures prepared during the four days following administration. The experiments described deal chiefly with the effects on *O. columbianum* ; it was found that daily doses of 0·2 g. per kg. body weight preceded by 5 ml. of 5% copper sulphate, repeated on three successive days, removed more than 60% of these worms from five out of six sheep. A dose of 0·6 g. per kg. body weight, administered in gelatin capsules (which almost invariably pass into the rumen) was given to group (a) with the total dose divided into three equal portions administered on three successive days ; to group (b) with the total dose divided into two portions administered on two successive days; and to group (c) with the total amount administered in one dose. This dosage removed over 60% of *O. columbianum* from 8 out of 11 sheep in groups (b) and (c) but from only 1 out of 6 sheep in group (a). In group (a) it was considered that, owing to passage of the divided doses of the drug into the rumen, there was at no time a sufficiently high concentration in the colon to kill a high proportion of the worms.

In a third trial the efficiency of pure phenothiazine administered (a) in capsules and (b) as a powder following a stimulating dose of copper sulphate, was compared

with that of a commercial phenothiazine (" thiox ") administered in both ways. The dose rate was 0·6 g. per kg. body weight throughout and the total amount was given in one dose. There were no significant differences between the degrees of efficiency shown in the four groups, the number of cases in which treatment removed more than 60% of *O. columbianum* being :– 3 out of 4 with pure phenothiazine in capsules, 4 out of 4 as a powder following copper sulphate, 5 out of 6 with " thiox " in capsules and 3 out of 5 as a powder following copper sulphate. It was concluded that " thiox " and pure phenothiazine were equally efficient and that when single doses of 0·6 g. per kg. body weight were used, preliminary treatment with copper sulphate solution did not increase the degree of efficiency.

I. HABERMANN, R. T., HARWOOD, P. D., & HUNT, W. H. (1940). **The Efficacy of Crude Unconditioned Phenothiazine for the Removal of Gastro-Intestinal Parasites from Sheep.**—*Proc. helminth. Soc. Wash.* **7.** 16–18. 1 table.

II. HARWOOD, P. D., HABERMANN, R. T., ROBERTS, E. H., & HUNT, W. H. (1940). **Preliminary Observations on the Effectiveness of Crude, Unconditioned Phenothiazine for the Removal of Worms from Horses.**—*Ibid.* 18–20.

I. Treatment of six culled sheep with 25 g. of crude, unconditioned phenothiazine indicated that this form of the chemical is as effective for the removal of nematodes from the gastro-intestinal tract of sheep as recrystallized phenothiazine. Apparently phenothiazine is less effective in sheep which are obviously ill than in healthy ones.

II. In doses of 80–90 g. per adult equine, phenothiazine removed most of 53 strongyles, and all of more than 100,000 cylicostomes from three horses and a mule. Reasons are given for accepting the view that the efficacy of the drug in removing strongyles was actually 100%. Possibly the doses employed were much larger than necessary.—R. FISHER.

MERZDORF, G. (1939). Versuch mit Prolan in öliger Aufschwemmung. **[Trials with Prolan in Oil].**—*Dtsch. tierärztl. Wschr.* **47.** 343–347. 2 tables.

A stable preparation of prolan (gonadotrophic hormone from the urine of pregnant women) in suspension in oil was made and tested in cases of sterility and of nymphomania in cows and in mares. Prolan is water soluble and has therefore a short period of action, but the suspension in oil has a much more prolonged action, as the active principle is slowly absorbed by the body. The injection induced oestrus in 15 out of 17 cows in which the ovaries were underactive, and cured sterility in 10 out of 13 cases. A number of cases of nymphomania were cured by the injections.—J. M. ROBSON.

POISONS AND POISONING

HORWITT, M. K., & COWGILL, G. R. (1937 & 1939). **The Effects of Ingested Lead on the Organism. I. Studies on the Rat. II. Studies on the Dog.**—*J. Pharmacol.* **61.** 300–310, and **66.** 289–301. 1 fig., 7 tables. [16 refs.]

I. Equal numbers of male and female rats were fed a diet of Ca : P ratio of 1·5 : 1 containing up to 200 mg. Pb as the oxide per kg. No significant differences in growth rate were found between suitable controls and those rats which received up to 100 mg. Pb per kg : a slight stunting of growth occurred in very young rats receiving a 200 mg. per kg. level but recovery was complete after the fourth month. Unless the diet contained more than 200 mg./kg. no fall in

blood Hb occurred and although there were a few cases of stippling in the r.b.c. of young rats at a 100 mg./kg. level, these disappeared by the fourth month. Reproduction was not affected up to the 100 mg./kg. level and bones of the experimental animals killed after about 200 days, when analysed for Pb, showed evidence of storage roughly paralleling the Pb intake. There was no corresponding significant elevation of the blood Pb content that could be correlated with the diet.

II. Twelve puppies were fed on controlled diets containing from 2–102 mg. Pb per kg. The Pb content of the soft tissues of two puppies killed at weaning was determined. No signs of poisoning developed in any of the animals although some basophilic stippling of the erythrocytes was noticed in dogs on the highest level of Pb intake during the second month of the experiment. X-ray examination of the bones failed to show any abnormal areas of Pb deposition. There were no pronounced differences in rate of growth or in Hb levels. Balance experiments showed that only a slight proportion of the ingested Pb was actually retained. The faeces were by far the most important channel of Pb excretion. There appears to be a direct relation between the Pb content of the bones and that in the diet.—ALFRED EDEN.

RICHARDSON, A. P. (1939). **Cyanosis in Chickens and Mice Induced by Sulfanilamide.**—*Bull. Johns Hopk. Hosp.* **65.** 445–455. 4 tables. [19 refs.] [Author's summary copied *verbatim*].

1. Methods of inducing sulfanilamide cyanosis in chickens and mice are described.

2. In chickens the cyanosis is explained by the formation of methemoglobin. In mice the presence of sulfhemoglobin accounts for the cyanosis.

3. Under the conditions described, sulfanilamide will convert hemoglobin into methemoglobin *in vitro*.

4. Methylene blue exerts a beneficial effect on the sulfanilamide cyanosis in chickens, but not on the mouse cyanosis.

PIERITZ. (1938). Akute Nikotinvergiftungen bei Menschen und Tieren. [**Acute Nicotine Poisoning in Man and Animals**].—*Z. Veterinärk.* **50.** 405–413. [11 refs.]

A solution used to destroy lice (3 pts. crude nicotine + 50 pts. glacial acetic acid in 1,000 pts. water) was applied to a horse and the animal was covered up; it sickened two hours later with the typical symptoms of nicotine poisoning. Symptomatic therapy was applied and the animal recovered. The same animal was by mistake rubbed with the solution a second time and again sickened, though less seriously. It is recommended that subjects should be carefully supervised after the external application of nicotine; the drug should never be applied all over the body at the same time to animals with very sensitive skins and they should be left uncovered. A survey of known cases of nicotine poisoning in animals and human beings is given.—V. CHLÁDEK (PRAGUE).

CHELLE, P. L. (1940). Quelques intoxications alimentaires chez les équidés. [**Plant Poisoning in Horses**].—*Rec. Méd. vét.* **116.** 5–16.

It has been recognized on the continent for some considerable time that the feeding of horses exclusively on certain species of clover gives rise to toxic symptoms. C. describes the symptoms arising from feeding horses on *Trifolium hybridum* and *T. pratense*, and states that the poisoning will only arise if the feeding is continued for not less than one month; no trouble arises if these clovers comprise only a small part of the ration. Ruminants are not susceptible to poisoning.

In horses the symptoms appear suddenly and consist of nervous and digestive manifestations, and sometimes cutaneous lesions. The nervous symptoms dominate the picture. The animal appears torpid, but this stupor may be broken by excitation, in which epileptiform fits may be exhibited. The syndrome closely resembles that of meningo-encephalitis. If feeding of the clovers is stopped as soon as symptoms are observed, recovery takes place in about a week. Similar symptoms may also arise from the feeding of *Vicia sativa*. Other plants recognized as being toxic for horses when mixed with the forage are *Equisetum* spp. and *Colchicum autumnale*. Details are also given of poisoning in horses arising from darnel (*Lolium temulentum*) and corn cockle (*Lychnis githago*). Natural poisoning from these agents is relatively rare, but C. quotes experiments carried out by several continental workers.—N. J. Scorgie.

PHYSIOLOGY

Lewis, W. H., & Lewis, Margaret R. (1939). **Studies on White Blood Cells.**—*Publ. Carneg. Instn.* No. 501. pp. 369–382. 1 fig. [Numerous refs.] Washington: Carnegie Institution of Washington.

This is an account of the study of living white blood cells in tissue cultures. New features are recorded as regards their origin, locomotion (especially when studied in motion pictures), duration of life, and change to other types, and other findings are confirmed. It is established, for example, that the monocyte is the progenitor of the macrophage and of the epithelioid cell, and also that these two cells are fundamentally identical.

Some difficulties were encountered in identifying the living cells in the cultures, and living spreads [small pieces of various tissues pressed into a thin layer between a cover-glass and slide] were examined with and without the use of vital dyes, as a connecting link between the moving cells of culture and the dead cells of fixed tissue.—C. W. Ottaway.

Hale, E. B., Duncan, C. W., & Huffman, C. F. (1939). **Rumen Digestion Studies.**—*Proc. 32nd ann. Meet. Amer. Soc. Anim. Prod. 1939.* pp. 389–398. 1 table. [4 refs.]

The main object of this work was to develop a method of measuring quantitative digestion in the rumen. The ingesta of the rumen were removed from a rumen fistula cow before feeding, as well as on six occasions 14 hours, and on one occasion 24 hours, after feeding. The contents were weighed, mixed, sampled and returned to the rumen. Eleven digestion trials were carried out on five normal Holstein cows to supplement the results obtained. The animals were fed on 10, 20 or 30 lb. of alfalfa hay per day.

The pH of the ingesta gave an average figure of 6·82. It fell during the first six hours after feeding and reached its maximum immediately before the afternoon feed. The temperature of the rumen contents was on an average 38·8°C., *i.e.* 0·5°C. higher than the rectal temperature.

Digestion coefficients, calculated on the lignin content of the ingesta, gave results for rumen digestion which were very similar to those for total digestion, indicating that digestion of lignin occurs, not in the rumen, but lower down in the tract.

Working on the lignin coefficients, it was found that 85 % of digestible cellulose was digested in the rumen; simple carbohydrates, including N-free extract, passed rapidly from the rumen; how much of this was due to bacterial fermentation

in the rumen and how much to onward passage of food was not determined. At the highest plane of nutrition, an increase in true fat was found, suggesting fat synthesis in the rumen. As the plane of nutrition increased, the digestion of protein and true fat in the rumen decreased, while that of ether extract, crude fibre and new crude fibre, increased. [This article is very condensed and consequently cannot be fully abstracted].—A. T. PHILLIPSON.

RITZMAN, E. G. (1938). **Cooperative Researches on the Nutritional Physiology of the Adult Ruminant.**—*Yearb. Carneg. Instn.* No. 37. pp. 329–331. Washington, D.C.: Carnegie Institution of Washington.

Metabolism experiments have been carried out on horses, steers, bulls, dairy cows, goats, sheep and pigs during the past 19 years, the main object of which has been to measure the basal metabolism of the animals under various conditions of season and climate. The horse has been found to have the highest basal metabolic rate [B.M.R.] per unit size of any animal tested, being nearly twice that of the rat, goat or man.

The discovery of factors relating to the remarkable lability of basal metabolism of the dairy cow, and to the marked increase caused by lactation, are the most interesting results obtained. The differences between beef and dairy cattle in this respect suggest that basal heat production varies with different functional adaptations and their requirements, which are in turn determined by internal factors (hormones). Studies on calves from the age of eight months to the end of the first or second lactation have been started, and so far show that a very high tissue stimulation, equal to that found in the lactating cow, occurs during growth.

The B.M.R. of the pig was highest during March, April and May and lowest during June, July and August. It was not affected by differences of environmental temperature, but during pregnancy it rose steadily and reached its peak during the early stages of lactation.

Experiments are in progress on the influence of the ingestion of pure sugars upon the respiratory quotient of the ruminant.—A. T. PHILLIPSON.

GREEN, W. W. (1940). **The Chemistry and Cytology of the Sperm Membrane of Sheep.**—*Anat. Rec.* **76.** 455–473. 5 figs. on 1 plate, 10 tables. [Numerous refs.] [Author's summary copied *verbatim*].

1. The membrane about the ram's sperm has been described. It stained poorly with some of the more common stains and was very difficult to observe if direct illumination was used.

2. It was visibly insoluble in many protein solvents. Trypsin did not attack it and only a slight action was noted when pepsin was used. Because of its properties, the protein of the membrane may be characterized as an albuminoid.

3. A Van Slyke protein analysis on the material remaining after the described extraction process indicated a high nitrogen content, high arginine, histidine, and cystine content, and an absence of lysine.

4. The use of aceto-carmine stain and dark field illumination made visible a small, hyaline vesicle located in the membrane at the anterior portion of the sperm's head. The per cent of vesicles present varied between samples secured from different rams and among samples from any given ram. As sperm quality was apparently lowered due to aging of the cells or frequent ejaculations, the number of vesicles was lowered. Some evidence was found which favored a larger number of vesiculated cells reaching the infundibulum in a given time. Tail pathology did not alter the per cent of cells exhibiting the vesicle but no cell with an abnormal head has borne a vesicle.

5. A correlation of 0·7 was found between the number of vesicles present in a sample and the rate of glycolysis as measured in CO_2 production.

6. The sheep sperm membrane does not fit the "acorn in the cup" description.

7. The use of aceto-carmine stain and dark field illumination is suggested as a new technic for the evaluation of (sheep) sperm quality.

ALDRED, Patricia. (1940). **A Note on the Osmotic Pressure of the Blood of Various Animals.**—*J. exp. Biol.* **17.** 223–226. 1 fig., 1 table.

By means of a modification of Hill's vapour-pressure method the osmotic pressure of blood (heparinized) exposed to 5% CO_2 in O_2 was determined and expressed in equivalent concentrations of NaCl. The mean value for sheep (0·978%) is definitely higher, and that for goats (0·955%) slightly higher than for other mammals including man (0·933%), horses (0·927%), cattle (0·936%) and dogs (0·933%) whereas birds have considerably higher values (above 1%). In frogs the mean value is only 0·73%, whereas in the tortoise there is considerable variation (0·80–1·16%).—ALFRED EDEN.

I. HANKS, J. H. (1940). **Quantitative Aspects of Phagocytosis as Influenced by the Number of Bacteria and Leucocytes.**—*J. Immunol.* **38.** 159–176. 7 figs., 4 tables. [18 refs.]

II. TUNNICLIFF, Ruth. (1940). **Action of Gastric and Salivary Mucin on Phagocytosis.**—*J. infect. Dis.* **66.** 189–191. 1 table. [4 refs.]

I. The results of this investigation reveal the direction and the extent of the misinterpretations which may arise from the failure to standardize the number of particles and leucocytes. The relative merits of LEISHMAN's [(1902). *Brit. med. J.* **1.** 73.] and HAMBURGER's [(1927). *Handb. biol. ArbMeth.* **4.** Pt. 4. 953. Berlin & Vienna: Urban & Schwarzenberg.] methods of expressing results of phagocytic tests are indicated as well as the effect of bacterial and leucocytic numbers on the effectiveness of the phagocytic system. The data are based on the phagocytosis of the H-37 strain of tubercle bacillus when rotated in a system composed of rabbit leucocytes and fresh normal rabbit serum. Suspensions of the bacillus in a buffered gelatinized saline were standardized by McFarland's opacity tubes and then by Wright's microscopic count method. Mixtures of different proportions of bacillary suspension and rabbit leucocytes suspended in fresh normal rabbit serum were rotated mechanically at 37°C. for 30–60 minutes and films were made, dried, fixed with formalin, stained by Ziehl-Neelsen's carbol-fuchsin and counter-stained by Wright's stain. Counts were based on the observation of at least 100 typical leucocytes and the results were recorded as the percentage of leucocytes which participated in phagocytosis (percentage-phagocytosis) and the average number of bacilli seen in each leucocyte (bacilli-per-leucocyte); from the latter figure the total number of bacilli phagocytosed in each tube was calculated.

Data given in tables and graphs showed that, with constant numbers of leucocytes, increases in bacterial numbers increased the values for percentage-phagocytosis and for bacilli-per-leucocyte. Within the range of ratios analysed the bacilli-per-leucocyte values changed as a linear function of the number of bacteria, while the percentage-phagocytosis values changed according to the logarithm of the bacterial numbers. As measured by the percentage of the available bacilli engulfed, the effectiveness of the phagocytic system decreased as the number of bacteria and the phagocytic value rose. Increases in the number of leucocytes lowered the percentage-phagocytosis and the bacilli-per-leucocyte values, but the effectiveness of the system was increased. With constant ratios of bacilli to leucocytes, when

the numerical density of the system was increased, higher phagocytic values and a greater rate of phagocytosis were obtained during unit time. It is stressed that neither the bacillary nor the leucocyte concentrations can be allowed to vary without changes being introduced in the amount of phagocytosis.

II. When *Streptococcus viridans*, *Staphylococcus albus*, a pneumococcus and a lactobacillus were mixed with gastric and salivary mucin and brilliant cresyl blue was added, the organisms did not take up the stain. If mixed with salt solution, saliva, ropy saliva, or egg white they stained instantaneously; it is deduced that mucin produced a coating which prevented the penetration of the stain.

In phagocytosis experiments mixtures of equal parts of citrated blood, suspensions of 24-hour broth cultures of streptococci and a staphylococcus, and a mucin diluted 1 : 4 with saline were incubated for 25 min., smeared on glass slides, dried and stained by Wright's method. The controls were mixed with saline solution instead of diluted mucin. A comparison made of the number of cocci ingested per leucocyte and of the percentage phagocytosis showed that both gastric and salivary mucin inhibited phagocytosis of the staphylococci and streptococci.

Intraperitoneal injections of 14 mice showed that phagocytosis of mucin-coated staphylococci did not occur for two hours, when rapid multiplication began and proved fatal in 24 hours. Control mice showed phagocytosis within one hour and recovered. Unstained mucin-coated cocci were demonstrated in vitally-stained mucoid material from mice three hours after injection and phagocytosis occurred only of stained cocci, uncoated with mucin.—R. O. Muir.

TECHNIQUE AND APPARATUS

Hanks, J. H., & Feldman, H. A. (1940). **The Concentration of Tubercle Bacilli from Spinal Fluid by Means of Chemical Flocculation and Lipoid Solvents.** —*J. Lab. clin. Med.* **25.** 886–892. 3 tables. [11 refs.] [Authors' summary copied *verbatim*].

1. A study of the bacteriologic diagnosis of tuberculous meningitis by means of chemical flocculation and by lipoid solvent methods showed that alum and chloroform provided more effective concentration of the bacilli during five minutes' centrifugation than was obtained by direct centrifugation for one hour.

2. For microscopic diagnosis it was important to distribute the clumped bacilli as well as to obtain efficient concentration; for this purpose the chloroform procedure was superior.

3. The alum flocculation method is recommended for cultivation or guinea pig inoculation.

Hehre, E. (1939). **The Preparation and Properties of Aqueous Suspensions of Oil-Coated Tubercle Bacilli.**—*J. Immunol.* **36.** 285–297. 1 fig., 4 tables. [Numerous refs.] Discussion pp. 297–300.

Details are given of a method for the preparation of aqueous suspensions of mycobacteria in minute droplets of paraffin oil. Such bacteria contained within oil droplets exhibit changes in their properties of acid-fastness, changes which do not occur if the oil is removed by ether before staining. Oil-coating, acting as a physical barrier, appears to retard the penetrative action of carbol-fuchsin, also retarding egress during decolorization. Mycobacteria coated with oil are agglutinated by electrolytes in the same way as are untreated organisms of the same

strain, and complement-fixation tests show that tubercle bacilli contained in oil droplets combine with specific antisera to the same extent as untreated organisms. The property of acid-fastness appears to be independent of the cell surface (*i.e.* whether oil-coated or plain). H. concludes from these observations that materials determining surface properties of mycobacteria, as well as antigenic substances of tubercle bacilli are present at the surface of the oil droplets containing the organisms. It would, therefore, appear that substances derived from the surface of the mycobacteria migrate through the oil layer to reach the surface of the droplet, exhibiting various specific properties associated with the untreated bacteria.—ALFRED EDEN.

HANKS, J. H., & FELDMAN, H. A. (1940). **A Study of the Demonstration of Tubercle Bacilli in Urine by Means of Phosphate Flocculation.**—*J. Lab. clin. Med.* **25.** 974–980. 2 tables. [5 refs.] [Authors' summary copied *verbatim*].

Among five methods studied, the most effective means of collecting tubercle bacilli from urine was by partial neutralization to obtain a minimal phosphate flocculation. The factors influencing the degree of concentration and the percentage of the bacilli collected were investigated.

Second-stage phosphate precipitations were shown to increase the concentration of the bacilli for microscopic examination and to provide a means of collecting the bacilli after treatment with acids prior to cultivation.

TOPPING, N. H. (1940). **The Preservation of the Infectious Agents of some of the Rickettsioses.**—*Publ. Hlth Rep., Wash.* **55.** 545–547. [6 refs.] [Author's summary copied *verbatim*].

The " lyophile " or " cryochem " technique offers an economical and convenient method for the preservation of rickettsial material.

GINTSCHEFF, P. Z. (1938). Synthetischer polytroper Nährboden zur Differenzierung der Typhus-, Paratyphus-, Coli-, Ruhr-, Diphtherie- und Pseudodiphtheriebazillen. [**Synthetic Polytropic Media for the Differentiation of Salmonella and Other Bacteria**].—*Zbl. Bakt. I.* (Orig.). **142.** 208–218. 2 tables. [4 refs.]

A " general utility " synthetic medium is described for the differentiation of *Salmonella*, *Bacterium coli* and dysentery, diphtheria and pseudodiphtheria bacilli. It consists of the usual phosphates, sulphates, chlorides and peptone in distilled water. Lactose and mannite are added and also two indicators, bromthymol blue and neutral red. For the indication of gas production, Durham tubes are included, and strips of filter paper soaked in 10% lead acetate are inserted to show whether or not sulphuretted hydrogen is formed.

A table is given in which it is shown how the different groups of bacteria react. The changes recorded concern the colour of the media, the production of gas and the blackening of the lead acetate paper.—R. LOVELL.

COOKE, Jean V., & BLATTNER, R. J. (1940). **Vital Staining of Virus Lesions on Chorio-Allantoic Membranes by Trypan Blue.**—*Proc. Soc. exp. Biol., N.Y.* **43.** 255–256.

An aqueous solution of trypanblue (0·5%) is run over the chorio-allantoic membrane which is subsequently fixed in 10% formalin and mounted in glycerin gelatin. The cells of normal membranes are invariably unstained, whereas the foci produced by viruses stand out prominently as isolated clumps of well-stained cells.—R. E. GLOVER.

CHORINE, V. (1939). Influence des anticoagulants sur le dosage des éléments du sang. [**Influence of Anticoagulants on the Estimation of Blood Constituents**]. —*Ann. Inst. Pasteur.* **63.** 213–256 and 267–399. 1 table, 2 graphs. [Numerous refs.]

This is a discussion concerning the effect of potassium oxalate, sodium fluoride, sodium citrate, heparin, liquoide (polyanethol sulphonate of sodium) and hirudin as anticoagulants on the blood of human beings, rabbits, sheep and poultry. A decrease, proportional to the amount of anticoagulant used, was observed in the proteins, glucose and other constituents of the plasma when compared with plasma obtained by centrifugation of blood to which no anticoagulant had been added. Heparin used in very small amounts in solution, caused no appreciable decrease in the plasma proteins. This decrease occurred only in the presence of red blood cells, *i.e.* in whole blood, except when liquoide was used as anticoagulant as this causes precipitation of the proteins. When the cells were removed the concentration of the plasma proteins remained constant. The cause of the decrease was due to the passage of water from the erythrocytes through their permeable cell walls into the plasma, *i.e.* the process is one of osmosis and the permeability of the red cells is governed by the pH. The permeability increases after acidification of the medium, reaches a minimum in the neighbourhood of pH 8·3 and gradually increases in a more alkaline medium. By observing the decrease of these constituents of the plasma it is possible to estimate indirectly the permeability of the cell walls to different ions and molecules.

It is concluded that the true concentration of proteins in plasma can be estimated only from fresh plasma obtained by rapid centrifugation or by the addition of a 0·5–2·5 % solution of heparin in the proportion of 100–150 mg. per litre. In order to determine the true plasma proteins of whole blood to which an anticoagulant has been added, it is necessary first to estimate the red cell volume because of the dilution of the plasma produced by exosmosis from the red cells.

—H. V. HUGHES.

ROSTEK, F. (1938). Farbmessungen am Blutserum mit dem Pulfrich-Photometer bei verschiedenen Krankheiten des Pferdes. [**Colour Tests of Blood Serum with the Pulfrich Photometer in Various Equine Diseases**].—*Inaug. Diss., Berlin.* pp. 15. 7 figs., 4 tables. [10 refs.]

A survey of the knowledge acquired in Germany concerning spectrophotometric investigation of serum is given, and the technique employed in examining the serum of horses affected with various diseases is described. R. concludes that in the serum of sick horses, the normal variations in colour and in the extent of light transmission or absorption are widely exceeded; that various diseases can be distinguished by the absorption curves of the sera and extracts; that the power of blood serum to transmit or absorb light in certain portions of the spectrum varies according to the erythrocyte content of the blood from which the serum is derived; and that pyrexia causes no reduction of the water content of the blood and hence occasions no alteration of absorption by concentration of colour. [The Pulfrich photometer is an instrument fitted with variable diaphragm attachments permitting quantitative measurement of the extent of transmission or absorption of light in passing through coloured fluids, and with a series of light filters which divide the visible spectrum from red to violet into a convenient series of wave-length bands. By using the filters in succession, the light absorbed in different parts of the spectrum is measured and a curve obtained which gives information on the mixture of coloured substances present. Bilirubin, for example, absorbs light of wave-length 520–440 mμ and an increased absorption by serum in this

range would suggest icterus. The numbers on the scales of the dial drums show percentage light absorption and also " extinction coefficients ", *i.e.* absorption expressed as a logarithmic scale which makes the numbers proportional to the concentration of coloured substance present.—Ed.]—G. W. WILLIAMSON.

CARTER, H. B. (1939). **A Histological Technique for the Estimation of Follicle Population per Unit Area of Skin in the Sheep.**—*J. Coun. sci. industr. Res. Aust.* **12.** 250–258. 3 figs. [7 refs.]

The method consists in (a) the removal of small snippets of skin from the living animal, (b) the preparation of histological sections parallel to the epithelial surface by an improved technique and (c) the charting of the relative positions of the fibres at a suitable magnification on metric graph paper. A simple differential count is made in which are recognized two types of follicles, primary (P) and secondary (S), the characteristics of which are briefly indicated.

The relationship between the primary population (P) and the total population (P + S) is recorded as a ratio in the equation $P : (P + S) = 1 : x$. The method is recommended not only as suitable for wide application in general biological studies of the fleece but as likely to prove of greatest value in genetical research.

I. BIGGER, J. W., BLACKLOCK, J. W. S., & PARISH, H. J. (1940). **Investigations and Observations on Inoculation Technique.**—*Brit. med. J.* Jan. 20th. 79–84. [5 refs.]

II. ANON. (1940). **The Supposedly Sterile Syringe.**—*Ibid.* 96–97. [1 ref.]

I. Readers will probably be familiar with the recent unsuccessful Irish legal action in which damages were claimed on the ground that a group of children who developed tuberculous lesions after inoculation against diphtheria with toxoid-antitoxin floccules (T.A.F.), did so because a suspension of living tubercle bacilli had been issued in error by the manufacturers. Whilst the authors' investigations were prompted by this case, their findings are of far reaching and daily importance. They fall into two main parts :– (1) the proof that the living tubercle bacilli could not have arisen from contamination during the process of manufacture or packing, or that if they had they would not have been alive at the date of injection and (2) the ways in which subsequent contamination might have occurred.

Only a brief summary of the first part need be given. No tubercle bacilli could be demonstrated microscopically, culturally or by inoculation of g. pigs by either of the workers concerned in any one of numerous samples taken from the two batches in question. It was shown by experiment, moreover, that even after massive contamination of T.A.F. containing the standard percentage of phenol (0·5 %), tubercle bacilli were killed in less than seven days and pyogenic organisms within 24 hours. Furthermore, whilst tubercle bacilli or pyogenic organisms could be recovered from rubber caps which had been purposely heavily contaminated, then waxed (126°–130°C.), and immediately tested, none of these organisms could be recovered if waxing was delayed 7–20 days or the bottles immediately waxed and the test made after ten days. (The shortest interval between filling or waxing of the bottles in the case concerned and their use was at least two months.) Whilst it would be extremely unlikely that a bottle of living tubercle bacilli would be substituted for a bottle of T.A.F., this possibility was negatived by showing that a suspension of the tubercle bacilli isolated from the children and of the opacity of the average suspension of T.A.F., contained many times the amount of tuberculin necessary to cause pronounced reactions in sensitive children. No such reactions were in fact reported. Such massive doses of tubercle bacilli would

also have necessarily caused grave infections with rapid dissemination and many deaths instead of, as was the case, localized lesions.

Part 2 of the investigations is of more general importance. It was shown once again that absolute alcohol or alcohol and ether are useless for sterilizing a syringe. Briefly, a small amount of sputum containing streptococci was drawn into a number 16 needle attached to a 5 c.c. syringe, the needle dipped in absolute alcohol, the syringe filled with T.A.F., 1 c.c. introduced into a tube of glucose broth, the needle dipped in alcohol again and a further tube inoculated and so on until it was empty, the syringe then rinsed with alcohol, and then ether, refilled and the processes repeated until the whole 28 c.c. had been transferred in 1 c.c. amounts to culture tubes. All 28 tubes showed streptococci after incubation.

The next section deals with possible contamination of syringes during mass immunization, or from wrapping in imperfectly sterilized towels for transport. Stress is laid on the importance of using fresh sterile needles for each subject and of using a freshly sterilized syringe when the first has been emptied. When using an autoclave for sterilizing towels, dressings etc. it is suggested that proper bacteriological control can only be achieved by such a method as the one in use regularly in the hospital to which one of the writers is attached, *viz*, by placing a tube containing a dried mixture of freshly manured garden soil and hay dust in the middle of each drum of dressings. This tube must be sterile after subsequent incubation. Tests have shown that the temperature in the middle of a batch of dressings is often far below that assumed from the pressure reading.

For another section of the investigation an experiment is reported showing that when a small drop of tuberculous sputum was placed on the rubber cap of a bottle of T.A.F. and 25 g. pigs inoculated with 1 c.c. each (withdrawn in lots of 5 c.c.), all those which lived over five weeks (*i.e.* 20) showed extensive tuberculous lesions (five died from intercurrent disease).

A further section deals with the necessity of carefully sterilizing the caps or bottles before withdrawing fluid for injection particularly as, for example, the practitioner's bag at the end of the day may contain swabs, samples of faeces, etc.

The last section deals with infection from the subject inoculated, the possibility of lighting up a latent bacterial focus and of transferring infection from this to another subject or to the bottle.

An article which will repay reading by all.

II. Editorial on the above, emphasizing the main points and elaborating somewhat the very low bactericidal power of absolute alcohol.—A. W. Stableforth.

Lebduška, J., & Pidra, J. (1940). Ueber die antiseptische Wirkung der Dämpfe fester Stoffe. [**Antiseptic Action of the Vapours of Some Solid and Liquid Substances**].—*Zbl. Bakt. I.* (*Orig.*). **145.** 425–438. 12 figs. [14 refs.]

The antiseptic effect of the vapour of substances vaporizing spontaneously at room temperature was investigated: 1 g. of the substance (solid or liquid) was allowed to vaporize from a small container in a petri dish in which *Bacterium coli* or *Staphylococcus pyogenes aureus* was inoculated on agar. Growth was completely inhibited by iodine, iodine trichloride, trichlorbenzene, salicylaldehyde and ammonium carbonate. Little or no growth occurred with paraform, *o*-cresol, chloral hydrate, chloretone, phenol, oxyquinoline, thymol and carvacrol. Many other substances tested had practically no inhibiting effect on bacterial growth. These included iodoform, benzoic acid, naphthalene, camphor and trypaflavine.
—J. M. Robson.

EDWARDS, F. R. (1939). **The Vein-Seeker. A Simple Instrument for Entering Collapsed Veins.**—*Brit. med. J.* Nov. 11th. 957. 1 fig.

EDWARDS, F. R., & DAVIE, T. B. (1940). **Preserved Blood—An Analysis of its Use. Report from the Merseyside War Blood Bank.**—*Ibid.* July 20th. 73–77. 3 figs., 7 tables. [16 refs.]

Both articles contain an illustrated description of an appliance for the finding of collapsed veins so that a blood transfusion can be given. The appliance consists of a hypodermic needle connected by a short length of rubber tubing to a further short length of glass tubing which is capped by a rubber pen-filler teat. The whole is sterilized and filled with sterile 3·8% sodium citrate. In use the teat is compressed and the needle inserted over the site of the vein, its entry therein being indicated by entry of blood into the instrument and a refilling of the teat, the blood being seen in the glass tube. The tissues are probed with the needle until this happens; then the transfusion is carried out by the insertion of the transfusion needle through and into the rubber tubing of the vein seeker, which is fixed to the limb by plaster or bandage while the transfusion is being effected. [This simple but ingenious instrument would be very useful in veterinary practice.]
—J. E.

I. MOYNAHAN, E. J. (1939). **Treatment of Acute Sprains by Procaine Infiltration (Leriche's Method).**—*Brit. med. J.* April 1st. 671–672. [10 refs.]

II. GRAY, D. G. (1939). **Procaine Infiltration for Sprains [Correspondence].**—*Ibid.* April 15th. 795.

III. FOWLER, G. A. (1939). **Procaine Infiltration for Sprains. [Correspondence].**—*Ibid.*

IV. MOYNAHAN, E. J. (1939). **Procaine Infiltration for Sprains. [Correspondence].**—*Ibid.* May 6th. 950.

M. claims that the period of disablement from acute sprains of joints in man can be considerably reduced by infiltrating the affected tissues with 2% procaine. The severe pain is removed and restoration of function is effected in one or two days.

G. suggests that equally good results can be obtained by an elastoplast bandage covered by a cold wet dressing.

F. reported equal success to that of M. with the procaine infiltration method.

All writers discussed the mechanism of sprain and M. replied on this point in IV.—J. E.

MISCELLANEOUS

——. (1939). **Advisory Committee on Biological Products. [Nat. Vet. Med. Ass. Gt. Brit.]**—*Vet. Rec.* **51.** 557–559. 2 appendixes.

The committee stresses the urgent need for the standardization and potency testing of biological products for use in controlling animal diseases. Evidence before the committee indicated that some such products obtainable in Great Britain were not submitted to proper tests for potency or standardization, probably because in some cases at least no suitable tests have been devised. The committee had also ascertained that some biological products, *e.g.* certain brands of lamb dysentery serum, were without any apparent value in the control of the disease in question. There was also evidence that biological products had been used which had actually been harmful to the animals to which they were administered. The committee, whilst recognising that only by standardization of biological products on an international basis can uniformity be obtained, urge the immediate institution of national standards and the potency testing of such products for use on animals

in Great Britain. In the appendixes the committee specify products for which an official standard is now available and products for which, in the committee's opinion, a standard could be prepared now.—N. J. SCORGIE.

—. (1939). **Therapeutic Substances. The Therapeutic Substances Amendment Regulations, 1939, dated September 20, 1939, made by the Joint Committee Constituted under Section 4 (I) of the Therapeutic Substances Act, 1925 (15 & 16 Geo. 5. C.60).** pp. 5. [3 refs.] London: H.M. Stat. Off. [8vo] [2d.]

This constitutes an amendment to the Therapeutic Substances Regulations, 1931 to 1939. The following paragraph has been added to the Regulations, 1931 :– " . . . every holder of a licence to manufacture therapeutic substances, who for any purpose engages in the culture or manipulation of pathogenic spore-bearing micro-organisms, shall provide to the satisfaction of the licensing authority separate laboratories and utensils and apparatus required for the culture or manipulation of such micro-organisms. The separate laboratories and utensils and apparatus so provided shall not be used for the manufacture of any other therapeutic substance ".

Part I of the present amendment sets forth provisions applicable to tetanus toxoid, either as a simple solution or in any other form, *viz*, definition and proper name; labelling; tests for sterility; tests to determine that specific toxicity of the toxin used has been completely removed, and tests for potency as an immunizing antigen.

Part II gives provisions applicable to gas-gangrene antitoxin (*Clostridium histolyticum*).—N. J. SCORGIE.

BINDEMANN, H. C. (1938). Verringert sich der Blutgehalt des Schlachtrindes bei Zerstörung der Medulla oblongata? [**Destruction of the Medulla Oblongata and Its Influence on the Blood Content of Slaughter Animals**].—*Inaug. Diss., Berlin.* pp. 43. 14 tables. [12 refs.]

B. made records of the live and carcass weight and weight of blood obtained at slaughter, of 240 cattle in half of which the medulla was destroyed by a bamboo rod after killing.

The results for both lots of animals were very close with a very slight difference as regards completeness of bleeding in favour of the animals in which the medulla was destroyed.

The procedure is also advised in order to abolish reflex movements.—J. E.

THIEULIN, G. (1938). Les moyens financiers de l'inspection vétérinaire sanitaire. [**The Cost of Veterinary Sanitary Inspection in France**].—*Rec. Méd. vét.* **114.** 769–787. 4 tables. [1 ref.]

T. described the methods by which veterinary inspection was financed both in the frontier districts and in the interior. Attention was drawn to the anomaly which existed in connexion with the inspection of cold storage plants. Under an act passed in 1933, those storing meat were required to be supervised by veterinarians of the Ministry of Agriculture and there was no tax for this service. In the case, however, of communal cold stores catering entirely for local needs, a tax was levied under the acts of 1905, 1921 and 1938, and the tax which was collected by the commune had to be repaid to the treasury unless the commune had become responsible for their supervision.

In the interior certain taxes were collected directly by the treasury and others by the communes, but the latter might be collected by the treasury if the commune

failed to organize a service of inspection commensurate with the tax imposed. T. considered that as many municipalities had adequate veterinary services it was only necessary to extend the powers of these services to ensure a comprehensive inspection of abattoirs, meat factories and markets.—H. V. HUGHES.

—. (1939). Organisation du cadre général des services vétérinaires des colonies. [**Organization of General Veterinary Services in French Colonies**].—*Rev. Méd. vét., Toulouse.* **91.** 225–234.

A decree issued in March, 1939 lays down the functions of the French Colonial Veterinary Service. They comprise :– (1) responsibility for sanitary police measures relating to animals, including research work into contagious and parasitic diseases and the formulation of administrative measures necessary for their control ; (2) the inspection of the edible products of animal origin, veterinarians being primarily responsible for the inspection of abattoirs and markets and of animal products which are imported or exported ; (3) the general control and development of the animal industry and the use of animal products, together with the supervision of breeding establishments ; (4) veterinary advice to farmers and breeders, and (5) collaboration with other services in the extension of breeding facilities, giving technical advice to agricultural institutions, the encouragement of marketing schemes for animals and their products, the study of flora in regard to their utility or injuriousness to animals, the development of useful and the destruction of harmful fauna, and the institution of schemes of work for the service.

The staff of the service is appointed by the Minister for the Colonies and consists of not more than three inspectors general, together with 12 chief veterinary officers, 44 veterinary officers and 44 assistant veterinary officers for every 100 members of the staff. The age of entry into the service is from 21–30 years and candidates must have satisfied the obligations of active military service unless they are medically exempt.

The decree sets out the scales of remuneration, regulations for promotion and disciplinary measures affecting members of the service.—H. V. HUGHES.

ERBAN. (1939). Der italienische Veterinärdienst im italienisch-abessinischen Krieg. Unter Mitbenutzung der Preisarbeiten 1937–38. [**The Italian Veterinary Service in the Italo-Abyssinian War**].—Suppl. to *Z. Veterinärk.* **51.** No. 10. pp. 48. 5 figs., 2 tables. [Numerous refs.]

This is a comprehensive and systematic review of the extensive literature, most of which is Italian, on the Italian-Abyssinian war. There are ten chapters on the topography, ethnology and climate of Abyssinia, Italian military operations, the preparations made for the personnel and for the equipment of the veterinary corps, veterinary services in the field, horse shoeing, reports and statistics, description of the more important diseases of animals, transport of material, and animal transport overseas.

A total of 247 veterinarians were engaged in the war. The number with veterinary qualifications is not given ; some of them were veterinary students released from their studies to participate in the campaign. Animal transport was utilized for practically everything except the transport of troops. About 100,000 transport animals were used, but the exact numbers of each class of animal are not clear. It is stated that 500 horses, 7,000 mules, 2,000 donkeys and 900 camels were bought for transport purposes. It appears that total losses in transport animals were at least 30 %.

The organization of the veterinary corps is described. It changed somewhat during the war, but in general followed the usual system. Animal hospitals,

convalescent camps and remount parks were organized. About 36,000 animals were treated for wounds or disease and 25,000 are said to have been cured.

The veterinary corps had to supervise meat supplies for the Italian armies, including the supervision of parks for living food animals, and also of frozen meat which was imported in large quantities.

Shoes for horses were supplied from Italy and were satisfactory but much trouble was experienced in providing shoes for mules and donkeys. The feeding of transport animals was difficult in that there were numerous cases of colic with some losses. There were also great losses in camels taken into the mountainous interior.

The most important infectious and parasitic diseases of animals during the war were African horse sickness, equine influenza, trypanosomiasis in horses, cattle and camels, piroplasmosis in horses and cattle, mange in horses and camels and helminthiasis in horses and camels. Notes are given on these and also on non-specific conditions such as heat stroke, saddle galls, loss from exhaustion and troubles from faulty acclimatization. Glanders was not present. A short account is given of the dietetics of transport animals and of the through traffic in animals from Italy.

Notes are also given on the various types of horses, mules, donkeys and camels used and on their suitability for the work. The paper closes with the conclusions of the Italian veterinary chief (General Intendant dall'Ora), and of E. himself.—J. E.

JACKSON, C. H. N. (1939). **The Analysis of an Animal Population.**—*J. Anim. Ecol.* **8.** 238–246. 1 fig., 1 table. [1 ref.] [Author's summary copied *verbatim*].

A mathematical technique is described by which, under certain conditions, the absolute number of animals in a population can be calculated from the percentage of marked animals recaptured. This technique forms a development of the idea of the " Lincoln Index ", and makes allowance for the factors of birth, death, and migration onto and off the area studied. It is illustrated by field data obtained from tsetse fly populations in East Africa.

ANON. (1940). **Photograph of a Sneeze.**—*Publ. Hlth Rep., Wash.* **55.** 1315–1316. 1 photograph.

A most illuminating photograph of a man sneezing is reproduced. It was taken by the technique of ultra high-speed photography, which substitutes an instantaneous flash of light for the opening and closing of the camera shutter. The stroboscopic light illuminates the object to be photographed with an intense flash of short duration, the light being placed in such a position in the picture as to illuminate the droplets with dark-field effect, so that they stand out sharply even in daylight and give photographic images larger than droplet size. The photograph illustrates the extent to which droplet infection can be spread directly from a patient.

BEATTIE, Margaret. (1940). **The Use of a Single Animal for Testing the Virulence of C. diphtheriae.**—*J. Lab. clin. Med.* **25.** 1111–1116. 1 table. [7 refs.] [Author's summary copied *verbatim*].

1. The rabbit is not a suitable animal for the assay of virulence of *C. diphtheriae* by intracutaneous inoculation.

2. The use of a single rabbit for virulence testing by the simultaneous inoculation of test culture suspensions and control suspensions containing antitoxin does not yield reliable results.

3. Experimental evidence is presented which suggests that guinea pigs are less subject to variation in reaction than are rabbits. This will be investigated further.

4. The simultaneous intracutaneous inoculation of test culture suspensions and control suspensions containing antitoxin causes considerable variation in the reaction of guinea pigs but less than that noted in rabbits. This evidence corroborates that presented by the experiments with control guinea pigs which indicates that individual guinea pig variation may occur.

DANFORTH, C. H. (1939). **Genic and Hormonal Factors in Biological Processes.** —*Harvey Lect. 1939.* pp. 246–264.

The functions and interrelations of the genes, hormones, organizers and vitamins are discussed, and evidence bearing on the evolution of sex and the significance and regulation of sex differences is considered.

Experimental study of factors controlling sex differences in the plumage of birds has led to the conclusion that it is necessary to regard the hormones as essentially nonspecific substances to which tissues of different species may or may not develop a capacity to respond. Observations on birds, and other species of animals and plants, suggest that one aspect of evolution may have involved a progressive adjustment of the cytoplasm to both intra-cellular and extra-cellular factors. The genes appear to give character to the cytoplasm or " condition " it, and at the same time supply substances with which it becomes progressively adapted to react during development. Adaptations to hormones and organizers seem to be of much the same nature. Apparently each new adjustment has come about primarily through a chromosomal alteration which imparted to the cytoplasm the capacity to utilize some substance already at hand.—R. ALLCROFT.

OFFICIAL AND OTHER REPORTS

SOUTH AUSTRALIA. (1939). **First Annual Report of the Council of the Institute of Medical and Veterinary Science, July 1938-June 1939.** pp. 15. 2 photographs. Adelaide: Govt. Printer. [4to].

The Institute [Director, E. WESTON HURST] provides for the Adelaide hospital and medical practitioners resident in Adelaide, services in clinical pathology, bacteriology, serology and biochemistry. It includes a small but active section devoted to general veterinary pathology, the work of which is still greatly hampered by the lack of an effective field service. The routine work of the Institute shows a marked increase over the previous year in all departments but especially in that of veterinary pathology.

The research activities of the staff during 1938–39 included the following investigations some of which have been completed :– salt optima in agglutination ; the effect of sera obtained from a normal cow and from a cow affected with brucellosis on the surface charge of *Brucella abortus* ; protein fractions isolated from *Haemophilus influenzae* ; classification of the pathogenic staphylococci ; determination of the normal level of natural antibodies in the population at large to several serological types of *Proteus* ; a serological study of the virus of tobacco mosaic ; the histological features of the Shope fibroma and of myxoma in the fibroma-immune rabbit ; vitamin C nutrition and susceptibility to diphtheria in relation to poliomyelitis ; the histology of acute anterior poliomyelitis ; some demyelinating diseases of the central nervous system, including a case of neuromyelitis optica and one of Schilder's encephalitis periaxialis diffusa ; the growth

of tumours on the membranes of the avian embryo ; a series of clinical and pathological investigations of cases of leucaemia ; the occurrence and treatment of " lamb sickness " ; abortion in ewes ; post-parturient haemoglobinaemia in cows, and enzootic ataxia in lambs.—H. B. CARTER.

SOUTHERN RHODESIA. (1938). **Report of the Chief Veterinary Surgeon For the Year 1937.** [SHARPE, G. C. H.] pp. 14. Salisbury : Rhodesian Printing & Publishing Co. [fcp].

STAFF.—There were 13 veterinary officers and 70 stock inspectors.

ANIMAL DISEASES.—The year was unfavourable for livestock rearing owing to lack of rain. The most important diseases occurring were FOOT AND MOUTH DISEASE and EAST COAST FEVER. RINDERPEST, CONTAGIOUS BOVINE PLEURO-PNEUMONIA and RABIES were not present, although they existed in neighbouring territories.

There were several outbreaks of F. & M. disease, the full history of each of which is given. A total of 40,600 cattle were involved and the policy of artificial infection of in-contact cattle, the segregation of infected herds and the prohibition of movements of stock was applied. The disease was definitely established in a koodoo which was shot and from which virus was taken and passed to cattle. Symptoms of F. & M. disease were also observed in some other koodoo and in an eland antelope. It was inferred that these antelopes were responsible for some of the outbreaks in cattle. A few outbreaks of E.C.F., mostly in the Melsetter district are reported ; the total mortality was 208 head. An attempt was made to ascertain the incidence of E.C.F. by examination of the spleens of all animals slaughtered at Bulawayo : 30,000 smears were examined and the presence of Koch's bodies was detected in three instances, but the animals themselves and the herds from which they came were free from E.C.F.

There were two outbreaks of ANTHRAX, one of HEARTWATER, six of SHEEP SCAB and 35 deaths from HORSE SICKNESS. Vaccine against the latter is issued.

TUBERCULOSIS was found in one slaughtered bull and two slaughtered pigs.

VARIOUS.—Information is given on imports and exports of animals and animal products and on meat inspection. There were 764,890 European-owned cattle, one and a half million native-owned cattle and 3,293 dipping tanks in the country.

—J. E.

CEYLON. (1939). **Report of the Government Veterinary Surgeon, Department of Agriculture, for 1937.** [CRAWFORD, M.] pp. 11. 9 tables. Colombo : Ceylon Govt. Press. [8vo].

DISEASE CONTROL.—There were 37 cases of ANTHRAX and of these 25 occurred in the Colombo quarantine in goats imported from India. Only two cases of BOVINE TUBERCULOSIS were observed, these being detected in the course of meat inspection at the Kandy abattoir. 18 cases of HAEMORRHAGIC SEPTICAEMIA occurred. The Island has been free from RINDERPEST since May 1934. 212 brains were examined by the Pasteur Institute and found positive for RABIES ; the policy of destroying stray dogs was vigorously pursued ; 90,000 were destroyed during the year. FOOT AND MOUTH DISEASE is still wide-spread although the total number of cases dropped from 21,989 in 1936 to 5,406 in 1937.

" Spotted deer were affected in large numbers and it is reported that some died probably from septic complications. Mr. Chandrasena visited the Sanctuary and sent specimens to the Veterinary Laboratory from spotted deer showing typical well developed lesions on the feet. This is the first time the Veterinary Laboratory has obtained good specimens of the disease from wild animals."

Effective control is extremely difficult in a country where fenced grazing grounds are practically unknown, where draught bullocks are still largely used, and where susceptible wild animals are plentiful in the undeveloped areas. NEWCASTLE DISEASE was not as common as in previous years.

RESEARCH.—Systematic investigations were not possible owing to lack of laboratory facilities. 555 specimens were received; a table is included giving details of results of examination of these specimens. 4,920 doses of fowl pox vaccine were sold in addition to that used on the Department's poultry farms.

QUARANTINE WORK.—A number of goats, cattle, sheep and horses were imported into Ceylon during the year. An outbreak of PLEURO-PNEUMONIA occurred in a group of 34 goats imported from Bangalore. Novarsenobillon given intravenously proved very effective in the treatment of this disease.

VETERINARY DISPENSARIES.—Two small dispensaries, one at Jaffna and the other at Ratnapura, were in operation for part of the year.

VARIOUS.—An account is given of the working of the Government Dairy at Colombo and of the livestock industry in general.—J. C. WALLACE.

INDIA. (1939). **The Thirty-Seventh Annual Report of the Director of the Pasteur Institute of India, Kasauli, for the Year 1937. Part I.** [SMITH, R. O. A.] pp. 47. 14 tables, 1 graph. Kasauli: Pasteur Institute of India. [4to].

This part of the report deals with the scientific aspect of the work of the Institute during the year. Rabies treatment was carried out at Kasauli and its 186 subsidiary centres; the total number of patients attending was 28,076, an increase of 3,179 patients on the 1936 total. The vaccine employed is a carbolized 5% sheep-brain vaccine prepared from a Paris strain. The brain of a sheep, which is completely paralyzed as the result of infection with this strain, is made into an 8% emulsion with 1% carbolic acid in normal saline. This is incubated for 24 hours at 37°C., and then diluted with normal saline to make a 5% emulsion. The vaccine is kept at room temperature for at least 30 days before use. There were 20,936 patients who received the full course of treatment and there were 90 deaths (0·43%). Five cases of post-treatment paralysis all made good recoveries. In the case of the persons who died the interval between the infecting bite and death varied from 11–347 days. A table shows the infecting animals in 248,832 cases treated between 1908 and 1937: 84·02% of these were dogs, causing 0·81% mortality and 12·15% were jackals causing 2·11% mortality. The highest death rate was caused through wolf bites (13·61%); hyaenas caused 9·24% and leopards 4·26%. There is one case of infection of a tortoise. All the Indian domestic animals appear in the list of offenders.—J. A. GRIFFITHS.

MALAYA. (1939). **Report on the Veterinary Departments, Malaya, for the year 1938.** [WHITWORTH, S. H.] pp. 91. Numerous tables, 1 map. Kuala Lumpur: Federated Malay States Govt. Press. [8vo] [$1 or 2s. 4d.]

The opening sections of the report deal with organisation and staff, and livestock survey, and describe the general position in regard to animal health and animal husbandry. The European staff numbered 12 and the Asiatic staff 131. Apart from sheep the total numbers of each species of animal showed a significant increase over the previous year. This increase was particularly marked in the case of swine, which numbered 652,243. There was no extensive outbreak of destructive disease during the year.

ANIMAL HUSBANDRY.—Local traditional methods of animal husbandry vary considerably in different parts of the country. The most elementary principles of animal breeding are commonly ignored, and selection of superior breeding

males is rarely carried out. Livestock shows and livestock classes at agricultural shows were organized during the year, and educational propaganda was continued ; progress was made with the Livestock Improvement Scheme in Negri Sembilan. Castration of scrub bulls was continued. Detailed observations on an indigenous breed of cattle in Trengganu are included. It is suggested that the characters of slow growth, late maturity and small body size are results of adaptation to a local mineral deficiency. There are general observations on buffaloes and their management, and on swine husbandry.

ANIMAL DISEASES.—Quarantine measures localized two outbreaks of RINDERPEST in Singapore which arose from infection introduced with imported oxen. Diagnosis was confirmed by subinoculation of test cattle. There was no recurrence of the widespread outbreaks of FOOT AND MOUTH DISEASE met with in 1937, but some spread occurred from a focus in the state of Perak. The early phases of the outbreak were characterized by a high level of infectivity, but when infectivity was lowered it was considered that the outbreak was in the process of natural extinction. The disease was mild. In all 1,122 head were affected and 9 deaths were reported.

A single outbreak of BLACKLEG in Kedah was investigated and the diagnosis confirmed by g. pig inoculation. An outbreak of HAEMORRHAGIC SEPTICAEMIA among buffaloes was effectively suppressed by quarantine and the inoculation of in-contacts with vaccine and serum. Agglutination tests failed to confirm the presence of BRUCELLOSIS in cases of abortion and retained placenta in European-bred cattle. Contagious abortion rarely, if ever, affects local cattle.

PIROPLASMOSIS and THEILERIASIS are frequent among indigenous cattle, but ANAPLASMOSIS has a lower incidence. Various cases of anaplasmosis and piroplasmosis occurred in imported cattle. Organisms resembling *Theileria hirci* were detected in blood smears in a locally bred goat. A case of CANINE PIROPLASMOSIS was encountered, a comparative rarity in Malaya despite the abundance of ticks. A minor outbreak of TRYPANOSOMIASIS occurred in dogs. A case of functional impotence in an imported Indian bull (a condition often encountered) appeared to respond to treatment with a course of tonophosphan injections. Several cases of ARSENICAL POISONING of cattle were noted.

A number of minor outbreaks of CONTAGIOUS ECTHYMA in goats was recorded. A few outbreaks of SWINE FEVER were noted ; sporadic cases and minor outbreaks occurred in widely separated centres. Although the lesions in sporadic cases were similar to those seen in epidemics, the disease in such cases was of very low infectivity, and it was thought that the sporadic disease might be a separate pathological entity. The report gives details of the various outbreaks. RABIES occurred in the northern states of Kedah, Perlis and Kelantan, restrictions being imposed on the export of dogs from these states. Muzzling and shooting orders were in force. No cases were recorded from other parts of Malaya and the control measures instituted in the Singapore outbreak of 1937 [see *V. B.* **9.** 440.] proved successful, so that the quarantine was raised in May 1938, six months after the last recorded case. The principal statistics of this outbreak are summarized and show that 12,125 dogs were vaccinated while 7,938 were destroyed. The gross expenditure on control measures amounted to nearly 30,000 dollars. New regulations were imposed enforcing six months quarantine for all imported dogs except those from rabies-free countries. Numerous outbreaks of DIPHTHERITIC STOMATO-PHARYNGITIS occurred among poultry in various districts. Tests showed that the virus remained viable for at least 14 days in infected cages. An outbreak of disease resembling INFECTIOUS LARYNGOTRACHEITIS was observed. SARCOPTIC MANGE of goats was seen. Other conditions noted were *Stephanurus* infection in pigs, and *Schistosoma nasalis* infection in a bullock. A filarial worm, *Stephanofilaria kaeli*

was found in association with a typical " Krian Sore " [see *V. B.* **9.** 440]. A collection of parasites from domestic animals in Kedah was started.

RESEARCH.—Transmission experiments, together with routine field and abattoir smears, suggested that diseases caused by *Babesia bigemina* and a *Theileria* species believed to be *Th. mutans* were enzootic in the Cameron Highlands and among locally bred cattle on the plains. There was no evidence of the existence of ANAPLASMOSIS in the former herd, while in the plains it was known to be sporadic and rare. It is emphasized that the immunity of the zebu to severe PIROPLASMOSIS is not due to an inherent racial resistance but is the result of infection early in life. The young calf is resistant and contracts the disease in subclinical form. The resulting state of premunization is subject to repeated reinforcement by infective ticks. The few European cattle reared from birth in the same environment as the local zebu have not shown an inferior level of resistance. Some observations carried out on imported Sindhi bulls suggested that they were not solidly resistant to the Malayan strains of *B. bigemina*. Clinical reactions were mild, but it was not clear whether the relatively high resistance was due to premunity or to natural racial resistance.

Observations on the course and treatment of several canine cases of TRYPANOSOMIASIS are included. A detailed description is given of the infecting trypanosome, which was identified as *T. evansi*, or a closely related species. Preliminary trials of the mercuric chloride test to detect bovine trypanosomiasis were carried out. Of serum from 79 oxen 59 gave a cloudy reaction, while sera from 80 buffaloes all produced a cloudy reaction. Further experiments and experience in interpretation were required before its diagnostic value in Malayan cattle could be assessed. A series of transmission experiments on CONTAGIOUS ECTHYMA of goats is described. No labial lesions developed in adult goats infected artificially by abdominal scarification. In young goats artificial transmission produced a mild infection and conferred some degree of resistance. A survey of poisonous plants was commenced.

The report concludes with statistics relating to traffic in animals, meat inspection, legislation, finance and livestock survey.—H. E. HARBOUR.

MOROCCO. (1939). Rapport sur le fonctionnement du laboratoire de recherches vétérinaires des troupes du Maroc pendant l'année 1939. [**Report of the Military Veterinary Research Laboratory of Morocco during 1938**]. [COSTE.] —*Rev. vét. milit.* **23.** 79–82.

Success is claimed for the treatment of sprains by local anaesthesia and exercise, but only in fresh cases [see also *V. B.* **10.** 888]. Vermifuges were successfully introduced into the caecum of horses through the abdominal wall by means of a trocar and canula, but the effects of the anthelmintics had not yet been investigated.

A gas mask for horses designed by VELU and CORMIER is reported upon very favourably.—G. WILLIAMSON.

TUNISIA. (1939). Rapport sur le fonctionnement du service de l'élevage pendant l'année 1938. [**Report on the Livestock Service, Tunisia, for 1938**].—*Bull. Off. internat. Epiz.* **19.** 47–54.

The chief epizootic of the year was FOOT AND MOUTH DISEASE, a benign form of which spread throughout the north of the territory. There were no cases of RINDERPEST, CONTAGIOUS BOVINE PLEURO-PNEUMONIA, GLANDERS, EPIZOOTIC LYMPHANGITIS, BLACKLEG or DOURINE. The only contagious disease of swine was SWINE FEVER. The number of cases of SHEEP POX and ANTHRAX again diminished in number. BOVINE TUBERCULOSIS is prevalent among imported cows in urban

dairies. Legislation prohibiting the importation of tuberculous animals and making compulsory the disinfection of infected byres was to be introduced. A prolonged outbreak of "EQUINE INFLUENZA" is recorded. The chief diseases of sheep were again caused by ectoparasites and helminths. There is evidence which suggests that the incidence of CANINE LEISHMANIASIS is greater than was generally supposed. Notes on the occurrence of other diseases including those of rabbits and birds are given.

At the Arloing Institute treatment of the following diseases has been studied and is briefly discussed—"HAMRA", PIROPLASMOSIS, BRUCELLOSIS, JOHNE'S DISEASE, FOOT AND MOUTH DISEASE, SWINE FEVER, EQUINE INFLUENZA, CONTAGIOUS ECTHYMA OF SHEEP and common PARASITIC DISEASES.—G. WILLIAMSON.

MADAGASCAR. (1939). Archives de l'Institut Pasteur de Tananarive Année 1938. **[Report of the Pasteur Institute, Antananarivo, for 1938].** [GIRARD, G.] pp. 63. Numerous tables. [12 refs.] Antananarivo: Imprimerie Officielle. [8vo].

The report is chiefly of medical interest but contains a veterinary section. 1,942 animal specimens were examined and 130 autopsies performed. Anthrax vaccine consisting of agar culture in 0·2% alum has proved very safe and satisfactory. BCG vaccination has been followed by considerable reduction in the number of animals showing tuberculous lesions on P.M. examination.

Researches on phenolized rabies vaccine have shown that when maintained at 2°–4°C. it is, as used, always virulent for rabbits in a dose of 0·5 c.c. inoculated under the dura mater. On subcutaneous inoculation it may be fatal if used less than seven days after preparation. 5 c.c. doses may cause fatal shock. Vaccine maintained at 37°C. is less virulent than that stored at a lower temperature and also has less protective value. Fixed virus maintained at a lower temperature than had been previously used proved to be of increased virulence.—S. J. GILBERT.

CZECHOSLOVAKIA. (1939). Tchécoslovaquie. Les maladies contagieuses des animaux en 1938. **[Contagious Diseases of Animals in Czechoslovakia in 1938].**—*Bull. Off. internat. Epiz.* **19.** 54. [2 refs.]

A tabulated statement of the numbers of cases which occurred of the common contagious diseases, the number of districts and communes affected being given. —G. WILLIAMSON.

UNITED STATES OF AMERICA. (1939). **Report of the Chief of the Bureau of Animal Industry for the Year ended June 30th, 1938.** [MOHLER, J. R.] pp. 85. 23 tables. Washington, D.C.: Superintendent of Documents. [8vo] [10 cents].

The U.S.A. remained free from FOOT AND MOUTH Disease, RINDERPEST, CONTAGIOUS PLEUROPNEUMONIA and SURRA.

ANIMAL DISEASE STATION [A. B. CRAWFORD].

BRUCELLOSIS OF CATTLE AND SWINE.—In co-operation with the Tuberculosis Eradication Division, field trials of calfhood vaccination were continued. To June 30th, 8,180 calves between five and seven months old have been vaccinated with strain 19 vaccine. Data are given of an experiment conducted to determine whether immunity resulting from vaccination during calfhood is maintained beyond the first pregnancy in the absence of exposure. Results are recorded on the transmissibility of infectious abortion from swine to cattle. Sulphanilamide was not found to be of therapeutic value for CONTAGIOUS BOVINE ABORTION. During the year agglutination tests were applied to more than 7,800,000 cattle in 671,300

herds and 4·1% reacted. At the end of the year 9,500,000 cattle were under supervision in the Bang's Disease project.

TUBERCULOSIS.—In the Nation-Wide Federal-State Project three additional states qualified for admission to the modified tuberculosis-free accredited area thus leaving only one state, California, in which all counties are not in the modified accredited area. Many different media were tried without success in an attempt to grow the acid-fast organisms found in lesions from " skin tuberculosis ".

MASTITIS.—Treatment by means of sulphanilamide gave indifferent results although in two cases of chronic streptococcal mastitis a cure was effected when large doses were administered.

POULTRY DISEASES.—Investigations into fowl leucosis were transferred to the station.

ANIMAL HUSBANDRY AND ANIMAL NUTRITION DIVISIONS [H. C. MCPHEE].

Numerous investigations relating to livestock improvement are recorded, the subjects dealt with being genetic investigations with g. pigs, the nutritive value of feeds, vitamin requirements of livestock and many meat investigations.

BIOCHEMICAL DIVISION [R. M. CHAPIN].

Routine production and testing of crystal-violet vaccine against hog cholera proceeded. From recorded investigations it appears that the age of pigs at the time of vaccination is an important factor in their acquirement or retention of immunity. Crystal-violet vaccine in doses as high as 30 c.c. seems to have no toxic effect on pigs. Data are given on the following :– disinfectants and anthelmintics, meat food products, tuberculin, and agglutination antigen for Brucellosis.

FIELD INSPECTION DIVISION [S. O. HADNESS].

SHEEP SCAB.—During the year 14,767,490 inspections and 1,235,022 dippings were carried out. Flocks in which infection was found included 50,005 sheep. It is believed that scabies of horses formerly present in Montana has been entirely eradicated. Details of meat inspections are tabulated.

PATHOLOGICAL DIVISION [H. W. SCHOENING].

Examination was made of 187 samples of blood serum from animals suspected of being affected or exposed to infection with glanders. Five positive reactions were obtained to the complement-fixation test. One case of DOURINE occurred.

Brain specimens from 37 dogs, 10 cats, 1 hog and 1 squirrel were examined for rabies. Three specimens from dogs were positive.

During 1937 more than 169,000 cases of EQUINE ENCEPHALOMYELITIS occurred causing 40,000 deaths. Data are given on work carried out on the role of blood sucking insects in the spread of the disease. It was determined that the so-called secondary or X disease following epizootics of encephalomyelitis was not prevalent.

Cases of acute INFECTIOUS ANAEMIA (SWAMP FEVER) are described. The virus was found to be very tenacious when subjected to cold and desiccation. Lice and an ex:ract of larval strongyles and of horse bots failed to transmit the disease. An attempt to make a spleen-tissue vaccine was unsuccessful, and sulphanilamide failed to cure affected horses. Progress was made in the preparation of a good antigen for the agglutination test for SWINE ERYSIPELAS, and much work was done on live vaccines (inconclusive). Mice and pigeons both gave good results as potency test animals for antiserum. Intravenous injections of crystal violet were found to be useless against bovine ANAPLASMOSIS; water therapy by stomach tube seemed to be beneficial in preventing death in affected cattle. Notes are also given on :– tests of anthrax vaccine, sodium bicarbonate therapy (useless) of shipping fever in cattle, potency tests of rabies vaccines, avian type tuberculosis in sheep and in calves, papillomatosis in cattle, actinomycosis and actinobacillosis, tests on material for diagnosis of various diseases, and on poisonous plants (*Tetradymia* spp., and sorghums).

Division of Tick Eradication and Special Diseases [W. M. MacKellar].

25,128,317 inspections or dippings of cattle and 2,897,082 inspections or dippings of horses and mules were conducted.

During the year 4,861 outbreaks of Hog Cholera were reported, an increase of 1,339 over the previous year.

Tuberculosis Eradication Division [A. E. Wight].

Most of the work done consisted of testing under the area plan. 14,108,871 tests were applied and the percentage of reactors was 0·6, the lowest degree of infection found since the project began in 1917. At the end of the year 6,471,538 herds containing 62,640,358 cattle were under supervision for eradication. Between 1917 and 1938, 3,651,520 reactors were removed from herds.

Tuberculosis infection was reported in 127,912 flocks of poultry on about 6,000 farms observed in 11 states.

Johne's Disease existed to a slight degree in ten states and 7·2% of the total number of cattle tested reacted. Agglutination tests for Bang's Disease were applied to 7,837,363 cattle in 671,308 herds and about 4% reacted to the test. During the previous year the percentage of reactors was about five.

Division of Virus-Serum Control [D. I. Skidmore].

A list is given of the biological products examined, and the work of the department is described.

Zoological Division [B. Schwartz].

Experiments on the treatment of animals infested with internal and external parasites are described. These included parasites of horses, trichomonads in cattle, coccidia in sheep, anaplasma, etc. Attempts at treatment for removal of the parasites are discussed. Barium antimonyl tartrate was found to be higlhy effective for removal of gapeworms from chickens under experimental conditions. In two cases phenothiazine (1 g. per kg. live weight), administered in capsules, removed all the ascarids and nodular worms harboured by pigs.—F. T. Boyle.

United States of America. (1939). **Report of the New York State Veterinary College at Cornell University for the Year 1937-38.** [Hagan, W. A.] pp. 229. 18 plates, numerous tables. [Numerous refs.] Albany: J. B. Lyon Company. [8vo].

The present policy limits the entry of students to 40 per year, thus making the total registration 160 students.

The number of animals treated in the clinics comprised 1,539 horses, 14,109 cattle, 680 sheep, 3,815 dogs and 977 cats, approximately the same as for the previous year.

The poultry laboratories issued 524,021 doses of chickenpox vaccine and 93,647 doses of pigeon pox vaccine. The Farmingdale laboratory on Long Island made and used experimentally 290,700 c.c. of duck cholera vaccine, while the Ithaca laboratory furnished free of cost to approved laboratories 173 litres of *Salmonella pullorum* antigen.

There are about 60 active research projects in the College, and in the appendix to the report a number of research reports are given on the following :– brucellosis, *Trichomonas foetus*, mastitis, poultry diseases, parasites of poultry and ruminants, physiological research, cultivation of acid-fast bacteria from soil, classification of saprophytic acid-fast bacteria, and Johne's disease.—F. T. Boyle.

BOOK REVIEWS

Henrici, A. T. [M.D., Professor Bacteriology, University of Minnesota]. (1939). **The Biology of Bacteria. An Introduction to General Microbiology.** pp.

xiii + 494. 112 figs., 1 plate. Boston, New York, Chicago, Atlanta, San Francisco, Dallas & London: D. C. Heath & Co. [2nd Edit.] [8vo] [15s].

This text-book provides a useful introduction for veterinary students to the general principles of microbiology and their application to diseases of animals. The bacterial nomenclature and classification of the first edition have been revised. Valuable features of the text are the systematic division of chapters into paragraphs with heavy-type headings, and the numerous explanatory illustrations.

A description of the theory and practice of microscopy and bacterial staining methods is followed by chapters devoted to protozoan and fungal life-cycles, the morphology and metabolism of the higher bacteria, and bacterial cytology, heredity and variation. Invaluable details of isolation methods and of the preparation of ordinary and selective culture media are given in a chapter on bacterial cultivation. Two brief chapters on bacterial infection and disinfection are followed by an unusually practical explanation of the terms, theories and tests involved in the study of immunity.

The system of bacterial classification is that of the latest edition of BERGEY's *Manual of Determinative Bacteriology*. [(1939). London: Baillière, Tindall & Cox. (5th Edit.)] Members of the three bacterial orders—Eubacteriales, Actinomycetales and Spirochaetales—are dealt with in detail. The genera *Listerella* and *Actinobacillus* are tentatively assigned to the miscellaneous Bacteriaceae.

An outline is given of the life cycles and transmission of parasitic genera of the order Spirochaetales. The diagnosis of protozoal diseases is discussed and life-cycles of representative genera are described.

The final chapter is devoted to diseases of man and domestic animals due to filtrable viruses.—R. O. MUIR.

COHN, F. (1939). **Bacteria. The Smallest of Living Organisms.** pp. 44. 4 figs. Baltimore: The Johns Hopkins Press. [4to] [$1.00].

This is a reprint of a translation dated 1881, of a book published in German in 1872 by the author, then Professor of Botany at Breslau University. The object of the reprinting is to draw attention to and to honour the author as one of the founders of bacteriology. It was Cohn who made possible much of KOCH's work.

In this book the author describes many bacteria, their biology and role in putrefaction and disease. He also lays the foundation of bacterial classification by recognizing six genera of bacteria.

The book will be of great interest to biologists interested in early bacteriology. —J. E.

SMITH, K. M. [F.R.S.] (1940). **The Virus. Life's Enemy.** pp. viii + 176. 19 figs. on 9 plates, 1 appendix. London: Cambridge University Press. [8vo] [7s. 6d.]

This is one volume of the "Cambridge Library of Modern Science" and is presumably intended for the layman who wishes to know something of modern science. The nature of viruses is described in three chapters and the results of virus action—disease in animals and plants—are dealt with in five further chapters. A few virus diseases of animals are briefly described as examples of the main theme and an incomplete list of them is given.—J. E.

LESLIE, A. [F.R.C.V.S., Chief Veterinary Surgeon, Federation of Taranaki Co-op. Dairies, Eltham, New Zealand]. (1938). **Diseases of Breeding Ewes.** pp. 147. 15 diagrams. Christchurch, N.Z.: Whitcombe & Tombs Ltd. [8vo] [9s. 6d.]

Written as a guide for agriculturists and farmers, this book is a simple exposition of those points of hygiene and management, neglect of which is responsible for much of the loss in sheep farming. The sections dealing with pregnancy are good, but those on abnormal parturition and the post parturient period tend to resemble a simplified veterinary text-book. The latest theories and treatments, however, are given, and it might be read with advantage by practitioners in sheep districts and by students as an introduction to sheep diseases.—P. S. WATTS.

VERZÁR, F. [Professor der Physiologie an der Universität Basel]. (1939). Die Funktion der Nebennierenrinde. **[Function of the Adrenal Cortex].** pp. 266. 16 figs., 4 tables. [Numerous refs.] Basle: Benno Schwabe & Co. [8vo] [Sw.frs. 25].

The author has been engaged in work on the suprarenal cortex for several years, and in this book he describes the results obtained and the important conclusions which can be drawn from them. According to his view the main function of the suprarenal cortical hormone is concerned with the phosphorylation of the flavin enzyme (vitamin B_2) and of glucose, but the hormone also plays a part in the metabolism of fats. All the data thus show that it is essential for the metabolic activity of the body. It is this specific interference with metabolism which, in cases of suprarenal cortical deficiency as in Addison's disease, leads to increase in the blood potassium with increased excretion of sodium, and to the changes in muscle metabolism which cause the asthenia typical of this condition.

The suprarenal cortical secretion is also essential for the normal functioning of the sex glands although the exact interrelationship is by no means clearly understood. It is, however, of interest that the chemical constitution of desoxycorticosterone, the most active suprarenal cortical substance yet obtained, is very similar to that of the steroid sex hormones, and the author suggests that the specific action which the sex hormones exert on the metabolism of the secondary sex organs is of a similar nature to the general effect exerted by the suprarenal cortical hormone on the metabolism of all body cells.

At present these findings are essentially of theoretical interest, but they should be of great value in developing the use in practice of suprarenal cortical steroids. The book deserves to be generally read and studied. It includes an excellent bibliography.—J. M. ROBSON.

PEACOCK, H. A. (1940). **Elementary Microtechnique.** pp. viii+330. 21 figs., 3 tables, 1 appendix. [Numerous refs.] London: Edward Arnold & Co. [8vo] [9s.]

Standard works on microtechnique are designed for advanced students and research workers and are consequently too comprehensive for the student of elementary biology. The teaching of microtechnique is concerned far too much with the practice of method, and far too little with the theory underlying its application; that microscopy may become a mechanical routine with little intelligent background is evident, but the contents of this book go far towards removing this danger. The treatment is logical, concise and informative. The directions for section-cutting and preparing mounts are sufficiently comprehensive, but there are several features which make a special appeal to the reviewer, *viz*, chapter III on "The Microscope and its Use" which deals with such subjects as construction, illumination, magnification, choice of lens combinations for various purposes, chapter VII on "Formulae and Hints", chapter VIII on "Sources and Culture of Material", and chapter IX on "Preservation of Material". The book can be heartily recommended to all students and laboratory workers.—C. HORTON SMITH.

CASTLE, W. E. [Professor Emeritus of Genetics, Harvard University, Research Associate in Genetics, University of California]. (1940). **Mammalian Genetics.** pp. viii+169. 131 figs., 8 tables. [Numerous refs.] Cambridge, Mass.: Harvard University Press. [8vo] [11s. 6d.]

This small book written by so eminent an authority as Professor Castle is a useful addition to the literature of genetics. The book, as the author states in the preface, is intended as a summary of present knowledge of the genetics of mammals. The opening chapters are devoted to a review of the chromosome theory of heredity; subsequent chapters deal with the more recent advances in genetics, *e.g.* hybridization, sex determination, sex linkage, lethal and sublethal genes and the inheritance of blood groups in man and rabbits. For examples and illustrations the author draws extensively on his own experimental work with rodents. In the chapters dealing with maternal inheritance and the inheritance of size it is surprising to find no mention of WALTON and HAMMOND's work with Shire horse and Shetland pony crosses. To *Veterinary Bulletin* readers the least satisfactory chapter in the whole book will probably be that entitled "The More Important Gene Mutations of Domestic Mammals". This is concerned for the most part with colour inheritance, whilst such an important aspect as the inheritance of utility characters, *e.g.* milk yield, receives only brief mention. On this subject there is now quite an extensive literature and it is to be hoped that the author will summarize it in a future edition of this book.

The book is illustrated with a number of excellent photographs, and numerous figures and tables. One extremely useful table summarizes some of the more important gene mutations occurring in domestic animals. References are given at the end of each chapter, which, while not being complete bibliographies, will suffice to inform the reader of the more important literature on the subject under consideration.

The book is written with a freshness of style and clarity of thought which hold the reader's interest throughout, and it may be confidently recommended to anyone seeking an authoritative introduction to the present position of mammalian genetics.—N. J. SCORGIE.

CASTLE, W. E. [Professor Emeritus of Genetics, Harvard University, Research Associate in Genetics, University of California]. (1940). **Manual for a Laboratory Course in Genetics.** pp. 33. 1 fig., 7 tables. Cambridge, Mass.: Harvard University Press. [8vo] [3s.]

This is a laboratory guide designed primarily to accompany "Mammalian Genetics" [see preceeding abstract], if it should be desired to use the latter as a class text-book for students; it could equally well be used with any text-book of genetics. The manual contains detailed descriptions of elementary experiments in inheritance with maize, *Drosophila*, mice and rats. Information is given as to the feeding and housing of the experimental animals. Some items are only applicable to American conditions, *e.g.* the instructions for growing maize and the sources of supply of laboratory animals, but as these can easily be adapted to suit any requirements this does not detract from the usefulness of the book. A feature of the manual is the easy introduction to statistical methods provided by the experiments described. These include the uses of probable error, a statistical study of continuous variation, and the calculation of correlation coefficients. The manual contains seven statistical reference tables.—N. J. SCORGIE.

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